National Library of Canada
Acquisitions and Bibliographic Services Branch
395 Wellington Street
Ottawa, Ontario
K1A 0N4

Bibliothèque nationale du Canada
Direction des acquisitions et des services bibliographiques
395, rue Wellington
Ottawa (Ontario)
K1A 0N4

Your file Votre référence

Our file Notre référence

NOTICE

The quality of this microform is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Reproduction in full or in part of this microform is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30, and subsequent amendments.

AVIS

La qualité de cette microforme dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

La reproduction, même partielle, de cette microforme est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30, et ses amendements subséquents.

Canada

UNIVERSITY OF ALBERTA

MICRO AND MACROECONOMIC EFFECTS OF CURRENCY DEVALUATION

THE CASE OF MALAWI

BY

© CHARLES S MATAYA

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF DOCTOR OF PHILOSOPHY

IN

AGRICULTURAL ECONOMICS

DEPARTMENT OF RURAL ECONOMY

EDMONTON, ALBERTA

SPRING 1994

National Library
of Canada

Acquisitions and
Bibliographic Services Branch

395 Wellington Street
Ottawa, Ontario
K1A 0N4

Bibliothèque nationale
du Canada

Direction des acquisitions et
des services bibliographiques

395, rue Wellington
Ottawa (Ontario)
K1A 0N4

Your file Votre référence

Our file Notre référence

The author has granted an irrevocable non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of his/her thesis by any means and in any form or format, making this thesis available to interested persons.

L'auteur a accordé une licence irrévocable et non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de sa thèse de quelque manière et sous quelque forme que ce soit pour mettre des exemplaires de cette thèse à la disposition des personnes intéressées.

The author retains ownership of the copyright in his/her thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without his/her permission.

L'auteur conserve la propriété du droit d'auteur qui protège sa thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

ISBN 0-612-11287-X

Canada

UNIVERSITY OF ALBERTA

RELEASE FORM

NAME OF AUTHOR: CHARLES SYLV MATAYA

TITLE OF THESIS: MICRO AND MACROECONOMIC EFFECTS OF CURRENCY DEVALUATION: THE CASE OF MALAWI

DEGREE: DOCTOR OF PHILOSOPHY

YEAR THIS DEGREE GRANTED: SPRING 1994

PERMISSION IS HEREBY GRANTED TO THE UNIVERSITY OF ALBERTA LIBRARY TO REPRODUCE SINGLE COPIES OF THIS THESIS AND TO LEND OR TO SELL SUCH COPIES FOR PRIVATE, SCHOLARLY OR SCIENTIFIC RESEARCH PURPOSES ONLY.

THE AUTHOR RESERVES ALL OTHER PUBLICATION AND OTHER RIGHTS IN ASSOCIATION WITH THE COPYRIGHT IN THE THESIS, AND EXCEPT AS HEREINBEFORE PROVIDED NEITHER THE THESIS NOR ANY SUBSTANTIAL PORTION THEREOF MAY BE PRINTED OR OTHERWISE REPRODUCED IN ANY MATERIAL FORM WHATEVER WITHOUT THE AUTHOR'S PRIOR WRITTEN PERMISSION.

Bunda College of Agric
University of Malawi
Box 219, Lilongwe Malawi

Date: April 26th 1994

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

THE UNDERSIGNED CERTIFY THAT THEY HAVE READ, AND RECOMMEND TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH FOR ACCEPTANCE, A THESIS ENTITLED "MICRO AND MACROECONOMIC EFFECTS OF CURRENCY DEVALUATION: THE CASE OF MALAWI" SUBMITTED BY CHARLES SYLV MATAYA IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN AGRICULTURAL ECONOMICS.

Michele Veeman
MICHELE M. VEEMAN (SUPERVISOR)

RICHARD D. BEASON (CO-SUPERVISOR)

T. S. Veeman
TERRY S. VEEMAN

ALEX W. JENKINS

James Eales
JAMES S. EALES

MERLE D. FAMINOW

Date: April 26th 1994

ABSTRACT

This study analyzes the impact of currency devaluation and related macroeconomic policies on Malawi's economy using the elasticities, absorption and monetary approaches to balance of payments. The major hypothesis in the study is that currency devaluations reduce balance of payments deficits.

Results obtained in the study indicate that nominal devaluations generate small but positive increases in Malawi's real exchange rate, and that changes in the nominal exchange rate are fully reflected in the import price. However, trade restrictions appear to exert the greatest negative influence on the real exchange rate, stifling the desired effects of a devaluation. Thus, the apparent failure of successive devaluations to restore Malawi's trade balance does not necessarily imply impotence of exchange rate policies but may indicate, that the potential for a devaluation to restore internal and external balance is undermined by extensive government interventions that make the economy less open to international trade, and foreign protective trade practices which restrict export volumes and implicitly exert a downward pressure on world commodity prices.

Although estimates of traded goods supply functions suggest the presence of a lagged relationship between traded goods and the real exchange rate, the estimated price and foreign income elasticities are low. With inelastic elasticity estimates, dependency on raw agricultural exports as a strategy for growth and development, needs to be re-examined.

The responsiveness of imports to real exchange rate changes also appear inelastic. As long as there are no local substitutes to imports, and the share of goods for intermediate consumption in total imports remains high, currency devaluations will only worsen the payments deficit.

Devaluations are expected to contribute to internal and external balance though expenditure switching. Since the hypothesis that currency devaluations alter the consumption pattern through expenditure switching is not supported by estimates in this study, other options, such as price incentives, should be considered as viable instruments for adjusting the product combinations to desired proportions.

Results of the monetary approach suggest that Malawi has been actively sterilizing foreign reserve changes. Although the monetary model yields plausible estimates, the indication that sterilization exists renders the monetary approach less applicable to Malawi's economy.

ACKNOWLEDGEMENTS

I am deeply indebted to Dr. Michele M. Veeman, my major supervisor, for her academic and intellectual support and guidance in this study and throughout the entire period of my graduate program. Her thoroughness and dedication made the thesis writing an extremely rewarding experience. I am also greatly indebted to Dr. Richard D. Beason, my co-supervisor, for his constructive criticism and advice on the organization of the entire thesis.

My special gratitude to Dr. Terry S. Veeman for his valuable comments and suggestions. My sincere gratitude is also extended to other members of the supervisory committee, Dr. Alex S. Jenkins, and Dr. Wictor Adamowicz for their inspiration and advice. I would like to express my gratitude to Dr. James S. Eales and Dr. Ruben Buse for their assistance in the analysis of some portions of the study. Support and encouragement received from Dr. Peter Apedaile and Dr. Davie Ng'ong'ola is greatly appreciated.

There are a lot of individuals and organizations that rendered support in the course of the study. But I would like to single out the Association of Universities and Colleges of Canada for funding the major part of my graduate program and the Rockefeller Foundation for funding the data collection phase of the study. I would also like to recognize the financial support provided by the University of Alberta for purposes of data collection and completion of the thesis. I would like to thank the International Centre and its staff, particularly Sharon Schultz and Doug Weir, for their special support during the period of my studies. Special thanks to Joan and Gurmit Sandhu, Ruth and John Martz, Norm and Phyllis Labrentz, and Terry Mackey for their moral support to all members of my family during our stay in Canada. I greatly appreciate the companionship and support that I received from the graduate students in the Department of Rural Economy, particularly, Krishna Hamal, Mike Ryan, and Janaki Alavalapati.

My special thanks to clerical and support staff in the Department of Rural Economy, particularly, Wendy Williamson, and staff members of Bunda College Library for their unflinching support and friendly smiles.

Lastly, but not least, I would like to express my heartfelt gratitude to my wife, Ida, my children, Benjie, Donna, Andrew and Chifundo for their patience, support and understanding during the entire period of my studies.

IN MEMORY OF MY BELOVED MOM AND DAD

AND

MY BELOVED SISTER TAMARA

TABLE OF CONTENTS

Item		Page
Part I	Introduction	1
Chapter 1	Introduction	2
1.1	Problem Statement	2
1.2	Malawi's Economic Environment and Policy	6
1.3	Conceptual Framework	11
1.3.1	The Elasticities Approach	12
1.3.2	The Absorption Approach	16
1.3.3	The Monetary Approach	20
1.4	Hypotheses	28
1.4.1	The Real Exchange Rate Effect	28
1.4.2	The Effect of Currency Devaluation on Trade Balance	28
1.4.3	The J-Curve Effect on Trade Balance	29
1.4.4	Exchange Rate and Price Transmission Effect	29
1.4.5	Expenditure Switching Effect	29
1.4.6	Price and Exchange Rate Effects on Balance of Payments	30
1.5	Methodology and Thesis Outline	30
1.6	Bibliography	32
Part II	Elasticities Approach to Balance of Payments Analysis	36
2.1	Introduction	37
2.2	Objective	37
2.3	The Real Exchange Rate: A Conceptual Framework	38
2.4	The Behavior of the Nominal and Real Exchange Rates in Malawi	41
2.5	Model Selection	43
2.6	Data	47
2.7	Empirical Analysis	47
2.8	Conclusion	53
2.9	Bibliography	55
Chapter 3	The Structure of Exchange Rate Pass-through in the Malawi's Economy	58
3.1	Introduction	58
3.2	Theoretical Model	59
3.3	Literature Review	63

3.4	Model Specification	65
3.5	Data	66
3.6	Empirical Estimation	66
3.7	Conclusion	70
3.8	Bibliography	72
Chapter 4	The Effect of Currency Devaluation on Trade Balance	74
4.1	Introduction	74
4.2	Theoretical Model	75
4.3	Literature Review	79
4.4	Model Selection	80
4.4.1	Almon Distributed-lag (ADL) Model	81
4.5	Data	82
4.6	Empirical Estimation	82
4.6.1	Effect of the Real Exchange Rate on Trade Balance	84
4.6.2	The Real Income Effect	86
4.6.3	The Market Liberalization Effect	86
4.6.4	The Trade Route Effect	87
4.7	Conclusion	87
4.8	Bibliography	89
Part III	Absorption Approach to the Analysis of Balance of Payments	91
Chapter 5	Expenditure Switching Effect of Currency Devaluation	92
5.1	Introduction	92
5.2	Theoretical Model	92
5.3	Literature Review	94
5.4	Theory of Demand	96
5.4.1	Properties of Demand Functions	98
5.5	Empirical Model	100
5.5.1	Almost Ideal Demand System (AIDS)	100
5.5.2	Weak Separability	103
5.5.3	Aggregation	106
5.6	Data	107
5.7	Empirical Estimation and Results	108
5.8	Conclusion	116

5.9	Bibliography	118
Chapter 6	Macroeconomic Effects of Currency Devaluation in Malawi	122
6.1	Introduction	122
6.2	Literature Review	123
6.3	Empirical Model	126
6.4	Data	134
6.5	Empirical Estimation and Results	135
6.5.1	Consumption of Traded and Non-traded Goods	135
6.5.2	Traded and Non-Traded Investment	135
6.5.3	Government Consumption	138
6.5.4	Exports and Imports	139
6.5.5	Supply of Traded and Non-traded Goods	144
6.5.6	The Money Market	145
6.6	Conclusion	146
6.7	Bibliography	150
Part IV	The Monetary Approach to Malawi's Balance of Payments	153
Chapter 7	Application of the Monetary Model to Malawi's balance of Payments Analysis	154
7.1	Introduction	154
7.2	Literature Review	154
7.3	Empirical Models	155
7.4	Data	157
7.5	Empirical Estimation and Results	157
7.6	Conclusion	161
7.7	Bibliography	162
Part V	General Conclusion	163
Chapter 8	General Conclusion and Policy Implications	164
8.1	Overview	164
8.2	Empirical Results	167
8.2.1	Malawi's Exchange Rate Determination	167
8.2.2	Price and Exchange Rate Transmission	167
8.2.3	The Effect of Currency Devaluation on Malawi's Trade Balance	169
8.2.4	Expenditure Switching Effect of Currency Devaluation on the Consumption of Traded and Non-traded Goods	170
8.2.5	Currency Devaluation and Related Macroeconomic Policies	170

8.2.6	The Monetary Approach to Malawi's Balance of Payments	173
8.3	Policy Implications of the Research Findings	174
8.4	Further Research	176
8.5	Bibliography	178
Appendix		180
		182

List of Tables

Item		Page
Table 1.1	Changes in Trade Balance and Overall Deficit	3
Table 2.1	Box-Cox Test	48
Table 2.2	Estimates of Real Exchange Rate Determinants, 1965 - 1988	49
Table 3.1	Estimates of Exchange Rate and Price Transmission Elasticities	67
Table 4.1	Determination of Lag Length	83
Table 4.2	Determination of Order of Polynomial	83
Table 4.3	The Effect of Currency Devaluation on Malawi's Trade Balance, 1965 - 1989	85
Table 5.1	Seemingly Unrelated Regression (SUR) Estimates of the Linear Approximation of the AIDS (LA/AIDS) Model	109
Table 5.2	Three Stage Least Squares Estimates of the LA/AIDS Model	110
Table 5.3	Test of Symmetry and Homogeneity of the LA/AIDS Model	112
Table 5.4	Weak Separability Test	113
Table 5.5	Estimates of Uncompensated Demand Elasticities of the LA/AIDS Model	114
Table 6.1	Estimates of Private Consumption of Traded and Non-traded Goods	136
Table 6.2	Traded and Non-traded Investment	138
Table 6.3	Estimates of Government Expenditure	139
Table 6.4	Estimates of Export Supply and Import Models	140
Table 6.5	Estimates of Traded and Non-traded Supply Functions	142
Table 6.6	Estimates of Demand for Money	146
Table 7.1	Estimates of the Reserve Flow and Sterilization Model	158
Table 7.2	Granger's and Sims's Causality Tests	160

List of Figures

Item		Page
Figure 1.1	Internal and External Balance	18
Figure 1.2	Effect of Currency Devaluation in the Monetarist Model	23
Figure 1.3	Effect of Currency Devaluation Under Imperfect Capital Mobility	25
Figure 2.1	Nominal and Real Exchange Rate in Malawi, 1965 - 1989	42
Figure 3.1	The Effect of Tariffs and Quantitative Restrictions on Pass-through	60
Figure 4.1	The Behavior of Malawi's Trade Balance Between 1965 and 1989	74
Figure 4.2	A Hypothetical J-Curve Effect	78
Figure 5.1	A Diagrammatic Representation of the Swan-Salter Model	94
Figure 5.2	Utility Maximization and Cost Utilization	98
Figure 5.3	A Hypothetical Utility Tree	104

Part 1

Introduction

Chapter 1.

Introduction

1.1 Problem statement

Until 1979, Malawi experienced vigorous economic growth and development as evidenced by an average growth rate of 6 per cent in real GDP, corresponding to an average annual growth rate of 2.5 per cent in per capita income (Office of the President and Cabinet 1987). External shocks to the economy such as rising interest rates and oil prices, reduced external demand and consequent deteriorating terms of trade, and external transport problems, were all contributory factors to serious external and internal imbalances experienced from the late 1970s onwards (Kydd and Hewitt 1986). The impacts of these shocks were exacerbated by poor rainfall in certain parts of the country, particularly in the 1979/80 growing season, resulting in reduced agricultural output. For example, smallholder[1] agricultural output fell by 1 per cent per annum between 1979 and 1984. The downturn in the economy, overall, resulting from the combined effects of these various factors can be observed from the successive falls in GDP by 0.6 per cent in 1979, 3.9 per cent in 1980, and 3.0 per cent in 1981 (Office of the President and Cabinet). As well, in each of the three years there was an increase in the overall balance of payments deficit (expressed as a ratio to GDP) by 8.40 per cent, 15.55 per cent, and 12.06 per cent. Although there has been a deficit in Malawi's trade and current accounts since independence, as documented by Kydd and Hewitt and as demonstrated by Table 1.1, the deficit in the balance of payments was not a major constraint to growth until 1979. By 1980, the deficit had nearly doubled its post independence annual average growth rate of 7.4 per cent.

---

[1]Smallholder in the Malawian context is used to describe a farmer whose land holding for agricultural production is small, usually less than 10 hectares.

Table 1.1. Changes in Trade Balance and Overall Deficit

Year	Annual Percentage Change in Exports of Goods	Ratio of Trade Balance to GDP	Overall Deficit (% of GDP)
1976	21.64	-6.02	-5.87
1977	17.34	-4.04	-6.06
1978	-14.71	-16.12	-9.10
1979	15.47	-16.56	-8.40
1980	22.69	-12.87	-15.55
1981	6.78	-6.18	-12.06
1982	3.63	-5.60	-7.35
1983	13.37	-5.13	-6.77
1984	42.13	3.79	-4.95
1985	-4.34	-3.20	-7.79
1986	9.12	-0.68	-
1987	28.56	-1.40	-
1988	20.06	-8.22	-
1989	-14.86	-15.08	

Source: Derived from Malawi's data on Economic Indicators 1976 to 1989.

Sources of financing the balance of payments deficit between 1975 and 1979 included domestic reserves, IMF quotas, Compensatory Financing Facility and the Eurocurrency Market. By 1980, these methods of financing were exhausted. Subsequently, balance of payment deficits were largely financed through three mechanisms, a series of short term financing facilities from the IMF, World Bank Structural Adjustment Loans (SAL), and rescheduling of official and commercial debt.

The contribution of external shocks to the economic crisis in Malawi and the Sub-Saharan Africa (SSA) in the late 1970s and mid 1980s is well recognized by third world development commentators. However, inappropriate domestic policies have been cited by the IMF, the World Bank and several scholars as the major contributory factors. In particular, the principal cause for each country's economic crisis is said to be associated with expansive demand policies as characterized by four factors: government spending far in excess of revenue, leading to budget deficits and inflation; failure to adjust exchange rates

to reflect internal inflation, leading to over-valued currencies; failure to maintain a balance between imports and exports in the face of rising prices of imported goods; and insufficient attention paid to policies that encourage expansion of aggregate supply.

Against this background, the IMF, in collaboration with the World Bank, initiated a Structural Adjustment Program (SAP) in most of the Sub-Saharan Africa, including Malawi, in the early 1980s with the aim of accomplishing the following two objectives: to facilitate the expansion and balanced growth of international trade, and to contribute, thereby, to the promotion and maintenance of high levels of employment and real incomes, and to the development of productive resources of all members as the primary objective of economic policy[2]; and to shorten the duration and lessen the degree of disequilibrium in the international balance of payments[3].

Central to the IMF-supported adjustment programme was the reduction in aggregate demand to the level commensurate with the country's productive capacity. Among the SAL conditions, currency devaluation was and still is considered the most effective instrument, not only for reducing aggregate demand, but also for improving external competitiveness through changes in the relative prices between the traded and non-traded goods sectors. The exchange rate policy, together with certain fiscal and monetary restraint measures, constituted the bulk of the conditions upon which the initial (1981) and subsequent World Bank SAPs were negotiated and implemented. These policies involve a series of discrete lending operations to provide quick or earlier action in disbursing balance of payments support to a country.

The role of currency devaluation in reducing the deficit in the balance of payments, through its impact on agricultural trade, has been substantially documented, particularly in developed countries. For discussion and analysis of the impact on agriculture, see Schuh (1974), Chambers and Just (1981, 1984), Paarlberg and Chambers (1988) and Grennes (1990).

---

[2]International Monetary Fund (IMF) *Articles of Agreement*. Article 1, Sec ii.

[3]Ibid., Article 1, Sec vi.

Devaluation of currency is expected to improve a country's international competitiveness in trade through changes in the relative price or the real exchange rate. The ensuing increase in the real exchange rate is expected to cause an expansion in the volume of exports and a shrinkage in the volume of imports. It is this differential adjustment in the former and the latter which is expected to lead to an improvement in the trade balance and the overall balance of payments, other things being equal.

While the effectiveness of the exchange rate policy in altering the balance of payments is well recognized, economists still disagree on the direction and magnitude of its impact on the agricultural sector as well as on the economy as a whole. This area of research has not received much attention in Malawi and other African countries even though exchange rate policy has been viewed by international financial authorities as a major instrument for structural adjustment in these nations. Since 1981 Malawi has negotiated four Structural Adjustment Loans (SAL) with the World Bank, followed by successive devaluations of its currency, the Kwacha. Almost a decade after the first SAP was implemented in Malawi, there are no visible or significant results relative to the magnitude of currency devaluation (97 per cent [4]) to suggest that the objective espoused in the SAL agreement have been achieved. Following the introduction of the SAP, there has been no discernible pattern of improvement in the export sector of which agriculture contributes nearly 90 per cent. Both the trade balance and the overall balance as a ratio of GDP remain negative. The apparent ineffectiveness of the exchange rate policy in improving the competitiveness of the export sector and the current luck of empirical studies evaluating such policies, in Malawi and other countries of the Sub-Saharan Africa, have prompted this study. Thus, this study seeks to analyze the impact of currency devaluation and related macroeconomic policies on Malawi's trade balance, balance of payments, and overall economy.

Results obtained from this study will provide valuable information on pricing and exchange rate policies to policy makers in Malawi and other countries in the Sub-Saharan Africa. Knowledge of the exchange rate impacts will provide a sounder bargaining position to developing countries when negotiating

---

[4]Estimated from the International Monetary Fund (IMF) *Annual Reports, Exchange Arrangements and Exchange Restrictions,* 1983-1989.

with the IMF and the World Bank for structural adjustment loans. Other beneficiaries of this study include lending and donor institutions themselves (the IMF, the World Bank, and related agencies). Correct exchange rate alignment will not only ensure stability and credibility of the international financial markets, but provide developing countries a basis for growth and development though an increase in the export base.

1.2 Malawi's Economic Environment and Policy

The performance of Malawi's economy reflects the impact of dynamic forces generated by the interaction between economic policy and the prevailing domestic and foreign socio-economic environments. The extent to which internal and external factors influenced Malawi's economy before and after independence in 1964, can be partly attributed to the country's physical and socio-economic characteristics. Malawi is a land-locked country occupying the southern part of the East African Rift Valley, and lying between 9 degrees and 17 degrees south of the equator. This geographical position translates into high haulage costs for Malawi's cargo, rendering the country's trade position less competitive. Malawi has a land area of 119,140 square kilometres of which 20 per cent is water. With the population estimated at more than 8 million in 1989, the country can be considered as one of the most densely populated countries in the Sub-Saharan Africa. The country does not have economically extractable mineral deposits, thus agriculture is the predominant economic activity, employing more than 90 per cent of the population. With the fixed land resource, a high population density could result in limited accessibility to arable land and reduced agricultural productivity under the present level of technology. Agriculture contributes approximately 40 per cent to the Gross Domestic Product (GDP), and 77 per cent to Malawi's export earnings. The sector itself has two components, the smallholder sub-sector (78.9 per cent of agricultural output), and the estate sub-sector (21.1 per cent). Although the estate sector contributes approximately 20 per cent of the agricultural output, it accounts for over 70 per cent of the export revenue, mainly through sales of tobacco, tea, and sugar. Thus, Malawi's post-independence success story, in terms of rapid economic growth, is mostly attributable to the expansion of the estate sector.

Agricultural policy in Malawi, which technically translates into economic policy, can be traced

back to the colonial economy. The structure of the colonial economy was characterized by three distinct sectors: the plantation sector, the smallholder cash-cropping sector, and the labor reserve sector. The colonial government's motive for promoting plantations in Malawi, then Nyasaland, was financial self-sufficiency. In pursuit of this objective, large tracts of land for plantation agriculture were sold to European settlers at concessionary prices in the 1880s (McCracken 1984). Land acquisition by the government in support of the plantation sector was enforced at the expense of the indigenous people. According to McCracken, transfer of land to Europeans was implemented by forcing indigenous people to seek wage employment on plantations through a hut tax system, thus creating a labor-reserve sector economy. The hut tax system not only facilitated land transfer but also provided cheap labor which made plantation agriculture highly competitive in international markets. The cheap labor strategy was also implemented through a quasi-feudal tenancy (Thangata in local language) through which peasants supplied labor to the plantation as payment for a piece of land on which they could grow subsistence crops (McCracken). Although labor was sometimes remunerated, the wages were far below subsistence requirements such that women had to grow food crops on tenanted or unalienated land to supplement the meagre incomes. The plantation economy initially concentrated on coffee and subsequently on cotton, tobacco and tea, following the collapse of coffee prices on the world market in the early 1930s (McCracken).

The peasant cash crop sector emerged out of necessity to meet increased demand for food by rapidly expanding plantations, and increased numbers of colonial administrators and missionaries. In addition, the peasant sector's economy was encouraged to expand by the colonial government's policy of allowing adult men to meet their tax obligation by growing cash crops. Although the emergence of the peasant cash crop economy was perceived as a threat to the plantation economy in terms of land and labor, the apparent inefficiency in the production of coffee, cotton and tobacco by the plantations only reinforced peasant production of export crops. By late 1928, 93 per cent of cotton and 63 per cent of tobacco was produced by peasants, and the smallholder export production had become the major source of economic growth (McCracken). However, the plantation sector continued to exploit the peasant producer through

monopsonistic buying of the latter's produce, a business in which the colonial government joined in 1926 by establishing a Native Tobacco Board (Nyasaland Government 1959).

Although the colonial government's agricultural policy initially emphasized large scale plantation agriculture, small scale agriculture became a major source of food as well as much needed government revenue in the late 1940s (Nyasaland Government). A serious famine that hit Malawi in 1950 justified development of the food self-sufficiency policy which still exists to date. The colonial government perceived food security as a precondition for development of both the peasant and the plantation-based export crops. With this policy, the country was expected to produce enough maize, groundnuts and rice to meet domestic demand, thus creating a conducive environment for expansion of the smallholder agricultural sector.

The post-independence agricultural policy incorporated many elements of the colonialist strategies. In particular, expansion of the large scale or estate agricultural sector was given highest priority. The major reason justifying the new government's bias towards large scale agriculture was skepticism with respect to smallholders' ability to generate sufficient and sustainable growth promoting output. Some factors contributing to the government's skepticism included peasants' vulnerability to weather fluctuations and the pressure to rapidly generate revenue for the government. However, as in the colonial era, the smallholder sector was regarded as a source of food supply and as a potential source of capital for industrial development, at least in the long run. In addition, development of the smallholder sector was perceived as a political obligation. It is against this background that Malawi's dual agricultural system and the bias towards the estate sector emerged in 1968.

The process of expanding estate agriculture in the independent Malawi involved alienating land from the peasantry and securing inexpensive operating capital from commercial banks. Extraction of surplus from smallholder agriculture, through commodity price control, constituted another important source of financing the estate sector. In order to fulfil this objective, the government established a statutory body called Agricultural Marketing and Development Organization (ADMARC). ADMARC was charged with the responsibility of selling inputs and purchasing all smallholder marketable surplus for resale at

auction markets within the country[5] or in foreign markets. Prices paid to smallholder farmers were fixed far below export parity prices to enable ADMARC to generate substantial profits. These profits were invested not only in the estate sector, but also in other enterprises such as commercial banks and processing industries. It has been estimated that smallholder farmers received 29 per cent of the auction price for tobacco while the estate farmers received the full price between 1964 and 1980 (United States Department of Agriculture, Economic Research Service 1989).

Declining producer incomes resulting from ADMARC's exploitative pricing system appear to have eroded farmers' incentive to engage in cash crop production. An observation in a study from the United States Department of Agriculture, Economic Research Service, suggests that reduced producer incentives contributed in part to low growth rates of smallholder marketed output during the 1970s and to increased migration of farm labor in search of remunerative off-farm employment. This report also observes that the rapid growth of the estate sector was a principal factor in the rise of the estate sector's share of GDP from 4 per cent to 7 per cent between 1964 and 1984, and the consequent decline of the smallholders' share from 51 per cent to 32 per cent.

The rapid export-led economic growth was abruptly curtailed in 1979 due to the poor performance of the tobacco estate sub-sector, caused primarily by weak management and poor financial structure[6]. Depressed output performance by the tobacco sub-sector translated into a reduction in export revenue, necessitating excessive borrowing from foreign commercial agencies in order to meet rapidly increasing public expenditures and demand for imports. Malawi's trade position in 1979 was made worse by escalating transport cost due to civil war in the neighboring country, Mozambique, which rendered the traditional trade routes through the ports of Nacala and Beira highly risky and eventually unusable. The

---

[5]Most of Malawi's tobacco is sold through auction markets before it is exported.

[6] Rapid rate of expansion during the 1970s by a number of estates was accomplished through an increase in the debt-equity ratio and by hiring inexperienced and alienated managers. However unfavorable market conditions resulting from the deteriorating international economic situation in the late 1970s made it difficult for many tobacco estates to make profits. Commercial banks who were major sources of financing were forced to intervene in the management and control of some of the farms. This resulted in the closure of ten per cent of the farms and a reduction in tobacco output.

above factors, coupled with rising international interest rates and world recession, contributed to an increase in the balance of payments discussed earlier and also an increase in the external debt service charge from K11.5 million in 1977 to K51.7 million in 1980, representing an increase in the debt service ratio from 5.2 per cent to 18.7 per cent over the same period (Office of the President and Cabinet).

The 1979 economic crisis unveiled deep rooted structural problems which required more than the traditional economic policy that Malawi had followed since it attained its independence. The introduction of structural adjustment programs (SAP) and structural adjustment loans (SAL) by the IMF and the World Bank in 1981, was in response to the uncovered structural problems. The primary objective of SAP have already been spelled out earlier. However each of the structural adjustments had a specific objective. In the first SAL, the IMF and the World bank stipulated an increase in the prices for smallholder produce to which the government responded by substantially increasing the relative price of maize, resulting in a phenomenal increase in maize production instead of a balanced increase in all cash crops.

The second SAL agreement still emphasized agricultural price incentives and improved financial and operational efficiency of ADMARC. Other conditions accompanying this SAL included mitigating supply constraints, enhancing productivity, and encouraging diversification of the estate sector through the establishment of an estate credit facility. Some of the stipulated objectives of the second SAL appear to have been achieved. For example, production of export crops relative to maize production responded positively to an increase in producer prices in the 1986/87 growing season (U.S. Department of Agriculture).

The third SAL agreement stipulated elimination of smallholder subsidies on fertilizer and establishment of an estate sector management, training and extension service to complement the estate sub-sector credit facility. Apart from encouraging increased production and diversification of the export base through price incentives, the agreement accommodated Malawi's long-standing policy of food self sufficiency.

In spite of the IMF's and the World Bank's intervention thorough SAP, Malawi's exports are still dominated by the estate sector and the country still faces balance of payments deficits. Although the

effectiveness of the structural adjustment program is influenced by a multitude of factors, this study emphasizes currency devaluation since this is considered as the major instrument for eliminating deficits in the balance of payments by both the IMF and the World Bank.

1.3 Conceptual Framework

Although the problem of balance of payments deficit was a subject of debate as early as the 18th century (Hume (1969), it is only recently with the pioneering article of Schuh that the contribution of agriculture to correcting the payments deficit has been brought into the main stream of debate. Schuh's article, which was basically a non-parametric analysis of the impact of exchange rate on agricultural trade and development, paved the way for more rigorous studies by other economists such as Chambers and Just (1981, 1984), Rauser (1986), (1975), Bredahl (1976), and Vellianitis-Fidas (1976), among others. However, the results obtained in various studies have been conflicting. As such, the effect of currency devaluation, in terms of direction and magnitude, on trade balance and balance of payments, is still debatable.

The theoretical relationship between currency devaluation and balance of payments has also faced serious challenges in the context of developing countries in recent times. A contractionary effect of a devaluation on aggregate demand is considered to be one of the major factors limiting the effectiveness of exchange rate policy in restoring balance of payments equilibrium after a change in the exchange rate. Among the first to raise the possibility that devaluation could prove contractionary include Diaz Alejandro (1963) and Cooper (1971). One major argument supporting the contractionary hypothesis is that even though nominal devaluations may achieve the goal of generating relative price readjustment, they do so at a high cost (Edwards 1986). One such indirect cost is said to be a decline in total output ("the contractionary devaluation critique").

Several reasons why devaluation can be contractionary have been suggested by Edwards. These include contractionary pressure on aggregate demand, the negative real balance effect, and an income distribution effect. Nominal devaluations can exert contractionary pressures on aggregate demand and

output which could more than offset the expenditure-switching effect postulated in the traditional theory. Higher prices associated with currency devaluation may generate negative real balance effects which in turn result in lower aggregate demand. A devaluation can also generate a negative effect on aggregate demand through its impact on income redistribution from sectors with low marginal propensity to save, to those with a high marginal propensity to save. In addition, Edwards argues that a recessionary effect may be generated if the price elasticities of imports and exports are sufficiently low that the effect of currency devaluation on trade balance would be negative.

Apart from the demand-related effects noted above, there are a number of supply-side effects which may render devaluation contractionary. A study by Wijnbergen (1982) indicates that devaluation can result in an upward (recessionary) shift of the aggregate supply if intermediate goods and informal (curb) financial markets are introduced to the analysis. This upward shift in aggregate supply is also expected if the cost of production increases due to an increase in the price of imported inputs, wages and the interest rate following a devaluation.

In spite of the recent theoretically-based discussions of the possible contractionary effects of devaluations, there is no authoritative empirical study that validates the postulated effects. While it is not the purpose of this study to resolve differences between outlined research findings, we survey three theoretical approaches which have been used to analyze the effects of currency devaluation on balance of payments. These are the elasticities approach, the absorption approach and the monetary approach.

1.3.1 The Elasticities Approach

The elasticities approach to balance of payments analysis was first developed by the English economist, Alfred Marshall (1842-1924), and was later incorporated into the balance of payments theory by Abba Lerner, Joan Robinson (1937), Fritz Machlup (1937), and Gottfried Haberler (1943). The notion that trade flows, and hence the balance of payments, are influenced not only by income effects, but also by relative price effects, is what spurred the development of the elasticities model.

The premise upon which the elasticities approach to balance of payments analysis was developed

is that the general price level and incomes in both the domestic and foreign economies are constant, and that changes in relative prices between one country and another result from changes in the nominal exchange rate (Williamson 1983). The postulated relationship between relative prices and nominal exchange rate is summarized in what is referred to as the purchasing power parity (PPP) principle; i.e., $P=eP^*$, where P and P* are domestic and foreign prices, respectively, and e is the nominal exchange rate in terms of units of domestic currency per unit of foreign currency. Since income is assumed to remain constant, the impact of exchange rate changes on trade balance and balance of payments is said to be determined by the relative price responsiveness or elasticities of both supply and demand for exports and imports, respectively.

In the light of the preceding assumptions and postulates, development of the elasticities model concentrated on determining conditions and combinations of price elasticities that would be needed for a devaluation to lead to an improvement in the trade balance and balance of payments. The necessary and sufficient condition for a devaluation to lead to an improvement in the trade balance has been referred to as the Marshall-Lerner condition in international trade literature, in recognition of the two economists, Alfred Marshall and Abba Lerner, who first derived its algebraic version. The Marshall-Lerner condition stipulates that for a currency devaluation to be effective in a small and dependent open economy, the sum of the export demand and import supply elasticities must be positive. Williamson provides a comprehensive discussion on the significance of the Marshall-Lerner condition as a prerequisite for currency devaluation to generate an increase in the trade balance.

Since the elasticities approach to balance of payments analysis assumes that prices and incomes are fixed, a partial equilibrium framework is implicitly chosen as the model for empirical analysis. Most studies on the effect of currency devaluation on trade balance and balance of payments in the early 1940s, obtained elasticity estimates that were too low to provide empirical support for the Marshall-Lerner condition (Williamson). However, Williamson observes that these studies were conducted during a period of widespread controls on trade which inhibited commodity responsiveness to exchange rate changes. Recent studies by Edwards (1989), and Diakosavvas and Kirkpatrick (1990) address the problem of choice

and definition of the exchange rate variable in estimating demand and supply elasticities. The above authors argue that the use of exchange rates that do not reflect the trading partner's trade volume is likely to result in biassed elasticity estimates. Elasticity estimates may also be low due to a lag in the adjustment of the trade flows (the J-Curve phenomenon) as well as rigidity in the price transmission (pass-through) mechanism throughout the economy (Thirwall 1980, Williamson 1983, and Dernburg 1989). Following a devaluation, trade balance is expected to get worse before an improvement is observed. The diagrammatic representation of the response in trade flows depicting the lagged adjustment in the trade balance resembles a letter "J" and has hence been referred to as the J-Curve (Dornbusch, Fischer, and Sparks 1981).

The J-Curve phenomenon is sometimes attributed to factors such as inelasticity of demand for imports, the existence of long term contracts that fix prices and quantities in future time periods, and time lags for producers and consumers to adjust to changes in relative prices due to factors such as production lags, uncertainty and economic expectations. In a country such as Malawi that has inadequate domestic alternative sources of fertilizer, oil and other intermediate goods, a devaluation translates into an increase in the import bill. Unless there is an increase in the export revenue that is sufficient to offset the increase in the import bill, currency devaluation may not lead to an improvement in the trade balance even if time for lagged adjustment to relative price changes is allowed.

The assertion that trade balance would respond to changes in the real exchange rate following a devaluation is made on the premise that price changes are perfectly transmitted in the domestic economy as well as in the trading partners' economies. In the case of imports, it is assumed that an increase in the import price is transmitted to consumers in the domestic economy. Accordingly consumers are expected to adjust their levels of imports, thereby reducing the aggregate volume of imports. Similarly, a reduction in the foreign-denominated price of exports is also expected to be transmitted to foreign markets such that the volume of domestic exports expands. It is this relative increase in the volume of exports and shrinkage in the volume of imports that leads to an improvement in the trade balance, other things being equal. Thus, elasticity of pass-through equals one where price transmission is perfect, and is less than one where

price transmission is less than perfect. If price transmission between domestic and foreign economies is less than perfect, then imports and exports can not adequately respond to relative price changes to restore equilibrium in the trade balance.

Price transmission, also referred to as "Pass-through", is influenced by trade restrictions and other government-instituted market distortions prevalent in most countries of the SSA including Malawi. Some of these distortions, which have been gradually reduced since the onset of Malawi's SAP in 1981, include government subsidies to producers and consumers, price regulation and taxation. Whereas foreign-denominated import prices may indeed rise after a devaluation, subsidies and regulated commodity and input prices are likely to offset the increase in the import price to the extent that producers' responsiveness to devaluation-induced signals is distorted. Less than perfect price transmission may also occur where competition in the market place is less than perfect. If this is the case, the benefits resulting from devaluation-induced price changes accrue to middlemen as economic rent. The characteristics of market structure in Malawi appear to fit the above description. The export market is characterized by a few foreign buyers or their agents and a large number of producers. Until the late 1980s the government had a firm control of the marketing of smallholder produce. Prices for most of the export commodities and commodities produced for domestic markets used to be fixed and announced in advance of the growing season.

Market imperfections are also evident in Malawi's import sector. Major imports such as fertilizer and agricultural chemicals have been heavily subsidized for most of the post-independence period (from 1964 to the mid-1980s). The sale and distribution of smallholder agricultural inputs is dominated by ADMARC. A few large companies such as AGRIMAL and Shell Chemicals are the major suppliers of inputs for estate agriculture. The extent to which the market structure impedes price transmission may thus help to explain the apparent absence of the J-Curve phenomenon in Malawi and other developing countries with similar economic characteristics.

1.3.2 The Absorption Approach

The major criticism of the elasticities approach is that it only considers the impact of relative prices on quantities of exports and imports, and ignores the income-expenditure effects of devaluation. Carbaugh (1980) argues that the larger trade is relative to national income, the less accurate will be the predictions of the elasticity approach. Pessimism with the elasticities model as an effective framework for analyzing balance of payments problems, led to the development of the absorption approach. This framework of analysis attempts to explain the effectiveness of currency devaluation on trade balance and balance of payments through its impact on aggregate demand.

According to Alexander (1952), net exports could expand only if total production could be raised or if domestic claims which are referred to as *absorption*, were reduced. From the national income identity, absorption refers to private consumption, investment and government consumption. Dernburg expresses Alexander's argument in mathematical terms as follows:

$$Y = A + (X - M), \tag{1.1}$$

$$A = C + I + G, \tag{1.2}$$

where, Y and A represents national income, and absorption, respectively, X and M are levels of exports and imports, respectively, I is investment level, and G is the level of government expenditure. By rearranging equation (1.1), it can be demonstrated that net exports must equal the difference between national income and absorption: i.e.,

$$X - M = Y - A. \tag{1.3}$$

Whereas devaluation raises the volume of exports, it also reduces the volume of imports. Thus, assuming that the economy has excess capacity in terms of labour and other resources, real national income should expand (Dernburg). From equation (1.3) it can also be demonstrated that,

$$\Delta(X - M) = \Delta Y - \Delta A. \tag{1.4}$$

A rise in income also raises consumption spending, and therefore absorption. However, a rise in

consumption is the product of the marginal propensity to consume and a change in income. If $\Delta A = \Delta C$, then,

$$\Delta A = b(1 - t)\Delta Y, \tag{1.5}$$

where t= tax rate, and

$$\Delta Y - \Delta A = [1 - b (1 - t)] \Delta Y = s \Delta Y. \tag{1.6}$$

Thus,

$$\Delta(X - M) = s \Delta Y. \tag{1.7}$$

From equation (1.7) we can deduce that the trade balance (X-M) can improve if devaluation raises domestic savings, or reduces absorption. As Dernburg rightly observes, resource re-allocation can only expand net exports if a rise in income is associated with a rise in savings. For this to happen, the marginal propensity to save disposable income and the income tax rate must both be positive, assuming that the government does not increase absorption by spending higher tax receipts. With low private savings and tax systems that are unresponsive to income changes, it is unlikely that these conditions would prevail in developing countries (Dernburg).

Assuming that capital inflows equal capital outflows, it is possible for a country with a fixed exchange rate to rectify its current account deficit through currency devaluation. However if such a country is suffering from excessive unemployment, pursuit of expansionary fiscal and monetary policies is likely to disrupt the equilibrium in the current account since the associated increase in national income may not only result in increased import volumes but also a rise in the price level rendering the export sector uncompetitive (Dernburg). Thus policies designed to restore current account balance or "external balance" can not be considered in isolation of policies designed to restore non-inflationary full employment or "internal balance".

Meade's (1951) synthesis of income and price effects on balance of payments provides a fundamental framework for simultaneously restoring external balance and internal balance. Internal balance

refers to the achievement of a high level of demand and employment that is consistent with avoidance of unacceptable inflation, while external balance refers to a state of equilibrium in the balance of payments (Williamson). In what is referred to as the "orthodox theory of the balance of payments", Mead proposes the use of two policy instruments with differential effects on income and balance of payments in order to simultaneously achieve internal and external balance (Williamson). Exchange rate policy is one of the two instruments and its role is to influence the structure of consumption between domestic and foreign goods (expenditure switching effect), whereas demand management policies such as fiscal and monetary policies constitute the other instrument which determines the level of absorption, depending on the relationship between current account balance and the level of unemployment.

The relationship between external and internal balance is further illustrated by Figure 1.1, developed independently by two Australian economists Swan (1960) and Salter (1955).

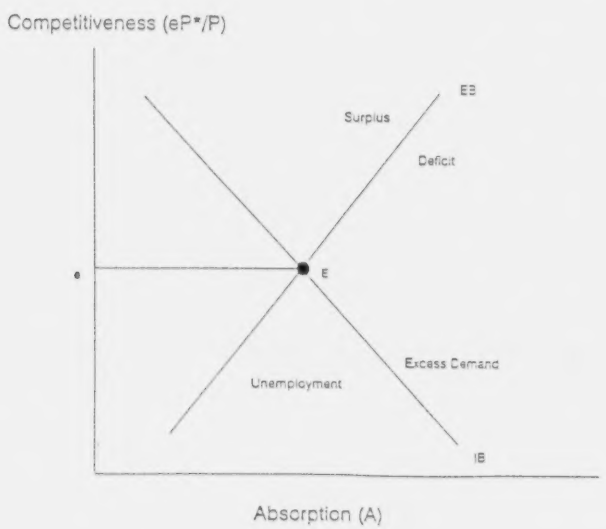

Figure 1.1. Internal and External Balance

Source: Williamson, J. *The Open Economy and the World Economy*. New York: Basic Books Inc, 1983.

The horizontal axis represents the level of domestic spending or absorption (A), and the vertical axis represents the level of international competitiveness of domestic goods as measured by the real exchange rate eP^*/P. Point E represents a combination of real exchange rate and absorption which is consistent with internal and external balance.

However, suppose the real exchange rate rises following a devaluation. As in the elasticities approach, the rise in the real exchange rate improves external competitiveness, exports rise, and consumers replace imports with cheaper domestic goods (expenditure switching), causing excess demand and adverse inflationary pressure on the economy. In order to offset the adverse inflationary pressure induced by a rise in the real exchange rate, absorption must be reduced to a point consistent with internal balance. Thus, the internal balance curve (IB) is negatively sloped with excess demand to the right, and excessively high unemployment to the left. This implies that lower real exchange rates are associated with lower export volumes and hence the economy requires higher levels of absorption to maintain full employment without inflation.

A rise in the real exchange rate can cause an increase in the export volume as well as a decline in the volume of imports resulting in current account surplus. Removal of the surplus requires adopting an expansionary fiscal policy which increases absorption through an increase in the demand for imports up to the point of external balance. The external balance curve is thus positively sloped with a deficit to the right and a surplus to the left.

The relevance of this conceptual framework is that for currency devaluation to succeed in restoring balance of payments equilibrium while ensuring full employment, it must be accompanied by a policy of expenditure reduction. Since one of the conditions for a SAL agreement is a cut in government expenditure and restraint on growth in the money supply, an expenditure switching effect on aggregate demand is expected to take place in a country that follows exchange rate policy within the SAP. However, the possibility of switching expenditure from imported goods to domestically produced goods is limited in countries that have inadequate alternatives to imported energy and intermediate inputs. For example in Malawi, intermediate inputs account for more than 35 per cent of the total import bill (Silumbu 1992).

The import bill for Malawi has, since the early 1970's, been inflated by the increased haulage distances that resulted from the disturbances and eventual closure of the railway route through the neighbouring country, Mozambique. The cost implications of the disruptions and eventual closure of the traditional trade routes were estimated at K121 to K135 per ton of rail freight from Malawi to Dar-es-Salaam in Tanzania with road/rail transshipment at Lusaka (World Bank 1984). It has also been estimated by the World bank that haulage by road over the same distance in 1984 cost K315 per ton, versus K35 per ton from Beira to Malawi. Under these circumstances, it is unlikely that expenditure switching could have taken place.

1.3.3 The Monetary Approach

In contrast to the elasticities and the absorption approaches which employ a differentiated analysis of the balance of payments components, the monetary approach is an overall balance of payments analysis. Following Keynesian theory, the money supply is one factor that influences aggregate demand via real money balances. An increase in relative prices that follows a devaluation reduces real money balances and hence real aggregate demand (Williamson).

Background work on the monetary approach to balance of payments analysis is associated with two schools of thought. The first school of thought is based on the IMF-based Polak (1957) framework which adapts the current account analysis to economies with limited or no capital mobility, or countries lacking monetary data. The second school of thought, the University of Chicago-based Mundell (1971) and Johnson (1972) monetary model originates from the traditional quantity theory of money and the international price-specie flow mechanism of Hume. The Mundell-Johnson model emphasizes joint equilibria in the balance of payments and the money market (Dernburg).

Although the two approaches are based on different assumptions, more simplified in the former than the latter, they have a common structural identity, the balance of payments equation. Dernburg expresses this equation as:

$$X - M + i^{*}F + K = \Delta R = \Delta M - \Delta D, \tag{1.8}$$

where i^{*} and F represent foreign interest rate and foreign investment, respectively, K is net capital flow, R represents foreign exchange reserves, D is domestic credit, and M is money stock. From equation (1.8) it can be deduced that trade balance (X -M) equals the balance of payments, holding net capital flow and net foreign income constant. Assuming that there is an equilibrium in the trading account, i.e, that the value of imports equals the value of exports, an increase in foreign reserves resulting from net capital flow and/or net income from foreign investment results in a balance of payments surplus. However, Williamson observes that if money supply is treated as a policy variable, then monetary consequences of payments imbalances are implicitly sterilized. A deficit in the balance of payments, for example, implies a loss in foreign exchange reserves which needs to be sterilized through credit creation, i.e., through an increase in D, or through dishoarding or a fall in M. Alternatively, an increase in foreign reserves, ΔR, must equal the increase in the money stock, ΔM, minus the increase in domestic assets held by the banking system, ΔD. This relationship makes the right hand side of equation (1.4) the focal point of the monetary analysis of balance of payments; i.e.,

$$\Delta R + \Delta D = \Delta M. \tag{1.9}$$

From the money market equilibrium, ΔM must equal demand for money. Defining the money demand function as:

$$M = L(Y, P, i), \tag{1.10}$$

where: $\partial M/\partial Y > 0$, $\partial M/\partial P > 0$, and $\partial M/\partial i < 0$, and substituting its differential expression into equation (1.9) yields the fundamental equation of the monetary approach to balance of payments:

$$\Delta R = \frac{\partial M}{\partial Y}\Delta Y + \frac{\partial M}{\partial P}\Delta P + \frac{\partial M}{\partial i}\Delta i - \Delta D. \tag{1.11}$$

The above expression shows that the balance of payments is an increasing function of real income and prices, but a decreasing function of interest rate and domestic credit.

An important variation to the analysis of balance of payments using the monetary approach is the

incorporation of asset-market theory which distinguishes between domestic money M, domestic earning assets B, and foreign earning assets, F. Equation (1.12) expresses asset holding in terms of the above variables as:

$$W = M + B + eF, \tag{1.12}$$

where W represents the nominal value of financial wealth in local currency. Monetary and balance of payments equilibria are said to occur when wealth holders are satisfied with the relative proportions in which different financial assets are held in their portfolios (Dernburg). Assuming that individuals perceive M, B, and F to be imperfect substitutes, the general asset-market theory predicts that a devaluation leads to an excess supply of F and an excess demand for M and B. The asset market gradually returns to equilibrium as the price of F falls due to an excess supply of F followed by a decline in the price of foreign exchange. The fall in the price of foreign exchange implies an appreciation of the domestic currency, a factor that gradually eliminates the current account surplus due to an increase in imports and a decline in exports. According to Dernburg, responses predicted by the asset market approach imply that in the long run the balance of payments cannot be in equilibrium unless the current account is also in equilibrium.

The main difference between the general asset-market approach and the monetary theory of balance of payments is that the latter assumes perfect capital mobility such that domestic assets (B) and foreign assets (F) are perfect substitutes and that investors are indifferent with respect to the relative proportions in which their various assets are held (Dernburg). The law of one price and arbitrage are also assumed to prevail, hence prices are equalised in all markets. A third assumption that makes the monetary balance of payments theory distinct from other theories is that wages and prices are flexible enough to ensure that the economy automatically equilibrates at full employment.

Assuming the conditions in the framework of the monetary approach to the balance of payments analysis hold, a temporary price change induced by interest rate or exchange rate differences induces trade in assets between countries until prices are equalized and the equilibrium in the current account is restored. An automatic equilibration in the asset market leaves only the money demand and supply as major determinants of balance of payments in the monetary model. In this case a balance of payments deficit can

only be offset by an increase in reserves. Thus an excess demand of money implies a surplus in the balance of payments whereas an excess supply implies a deficit.

The effect of currency devaluation on the balance of payments within the context of the monetary model can be explained through a price effect. Devaluation implies an increase in the world price level in terms of domestic currency. Since the monetary model assumes the existence of perfect arbitrage and the law of one price, an increase in the world price implies an increase in the domestic price level. As demonstrated by the balance of payments equation (1.11), the price increase generates a surplus in the balance of payments due to an increase in the demand for money.

The effect of currency devaluation on the balance of payments can also be illustrated by adapting a Mundell-Fleming IS-LM model to monetarist assumptions, as is presented in Figure 1.2.

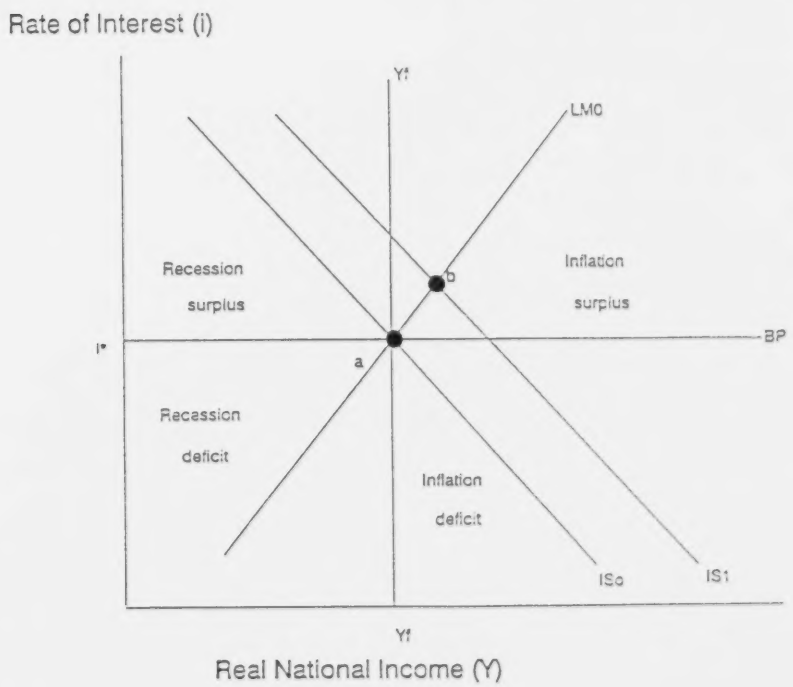

Figure. 1.2 Effect of Currency Devaluation in the Monetarist Model.

Source: Dernburg, T. F. *Global Macroeconomics*. New York: Harper and Row, 1989.

Whereas the IS curve represents the locus of equilibrium in the goods market as characterized by the condition that I = S ex ante [7], the LM curve represents the locus of points of equilibrium in the asset markets. The vertical and horizontal axis represent the interest rate and real national income respectively. The IS curve slopes downwards because lower interest rates stimulate investment which requires a higher income level to generate a corresponding increase in savings. The LM curve slopes upwards because an increase in income raises the transactions demand for money and thus requires an increase in interest rates to induce a corresponding reduction in speculative demand. The intersection between the IS and the LM curves represents a short run equilibrium in the economy.

With the assumption of perfect capital mobility the balance of payments curve, BP, is horizontal at the world interest rate i^*. Whenever the domestic interest rate is above i^* a surplus emerges, and whenever it is below i^* a deficit emerges. The assumption of automatic equilibration of national income at full employment implies that the domestic interest rate i is equal to the foreign interest rate i^*, and that the national income Y represents full employment income Y_f. Thus the intersection of the vertical and horizontal lines drawn to represent Y_f and Bp determines the point at which the IS and LM curves intersect.

Suppose that IS_o and LM_o, which represent the initial LM and IS curves respectively, intersect at a predetermined point a, and consider the effect of a decrease in the foreign currency-denominated price of export goods following a devaluation. The decrease in foreign currency-denominated price of exports, which is essentially an increase in domestic currency denominated price of exports, stimulates exports as long as arbitrage prevails. The IS curve shifts to the right (IS_1) as a result of a temporal increase in the real exchange rate to intersect the LM_o curve in the surplus zone at point b. With the increase in aggregate demand, the domestic aggregate price level rises and tends to shift the LM curve to the left due to a reduction in money balances. But the incipient shift in the LM curve to the left is offset by the accumulation of foreign exchange following an increase in export volume. If the two opposing forces exactly offset each other the money balances as well as the LM_o curve remain unchanged. However, the

---

[7] In the extended model of an open economy with fiscal policy, the condition for equilibrium is (I - S) + (G - T) + (X - M) = 0; see Williamson.

domestic price level will keep rising and the surplus will persist as long as the IS and LM curves intersect to the right of Y_f and the intersection is above i^*. The rise in the domestic price relative to the world price reduces the real exchange rate and consequently the trade surplus declines. This pushes the IS curve back to IS_o, restoring the original equilibrium but at a higher domestic price level. Thus the monetary model predicts a temporal increase in the balance of payments surplus as a result of a proportionate increase in the price level, which restores the real exchange rate to its original position.

Few of the assumptions of the monetary approach to the balance of payments analysis are quite consistent with the economies of most developing countries, including the countries of the Sub-Saharan Africa. With underdeveloped capital markets, capital mobility can be assumed to be less than perfect or zero. Under these assumptions, the predictions of the monetary model with respect to the effect of currency devaluation on balance of payments largely depend on the relative changes in the export volume and money stock.

Consider the effect of currency devaluation in an economy with zero perfect capital mobility. Since capital movements are autonomous, the balance of payments curve is vertical as in Figure 1.3, indicating that capital movements are not susceptible to short run interest rate variations.

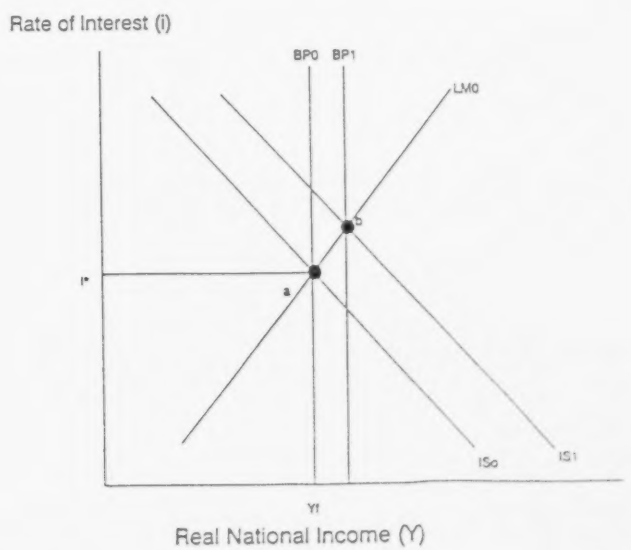

Figure 1.3 Effect of Currency Devaluation Under Imperfect Capital Mobility

As demonstrated in Figure 1.2, a devaluation causes the IS curve shift from IS_0 to IS_1. With an increase in foreign exchange following a real exchange-induced rise in export volume, the balance of payments curve shifts to the right (BP_1) . Although a rise in foreign reserves, and hence money stock, tends to push the LM curve to the right, a reduction in real money balances, induced by an increase in the domestic price level, offsets the incipient effect. As the domestic price continues to rise, the real exchange rate declines, thereby reducing exports and increasing imports. The surplus in balance of payments declines, shifting the BP curve as well as the IS shift back to the original equilibrium position with an increase in the price level. The same conclusion, that devaluation results in a temporally balance of payments and an increase in the domestic price level, is apparent from the above discussion.

The major weakness with the monetary model, however, is the assumption that prices are flexible enough to ensure that the economy achieves internal and external equilibrium simultaneously (Williamson). Overall, the relevance of the monetary model in analyzing the effect of currency devaluation on trade and balance of payments in the SSA is debatable. The assumption of perfect capital mobility, arbitrage and automatic equilibration are not consistent with the situation in countries in which exchange rate policies have been the major instrument for restoring equilibrium in the balance of payments. In spite of the wide spread application of the monetary model in dealing with balance of payments problems in a number of developing countries[8], there has been insufficient evaluation of the model with respect to its theorized predictions.

The three approaches to the analysis of balance of payments issues are complementary to each other, rather than being competitive, for they each represent different methods of examining the same problem. With the help of Figure 1.3, it can be demonstrated that the three approaches are related. Consider the elasticities approach. Currency devaluation results in an increase in the relative prices of domestic and foreign goods, and a shift in the IS curve to the right. Assuming the Marshall-Lerner conditions hold, the increase in relative prices induces an increase in foreign reserves, and hence an improvement in the balance of payments. An improvement in the balance of payments shifts the BP curve

---

[8]See a survey by Kreinin and Officer (1978).

to the right. However, a nominal devaluation has these effects only to the extent that it leads to a real devaluation rather than being neutralized by price changes (Williamson). If income is constant, assuming that Y_f represents a sustainable real income level or full employment level, a shift in the IS curve results in a balance of payments deficit. Thus Johnson considers the elasticities approach to balance of payments analysis as most suitable for countries whose foreign trade sectors are small relative to their economies, or for countries with ample unemployed resources. The characteristics of Malawi's economy are quite consistent with Johnson's criteria for applying the elasticities framework.

The absorption approach is Keynesian in its focus on treatment of total output and expenditure, and does not differentiate among sectors. Although it neglects the monetary effects of a devaluation, it provides a framework for analyzing internal and external balance. In the context of internal and external balance a rightward shift in the BP curve (Figure 1.3) following a devaluation is not sufficient to improve the balance of payments. If the BP curve shifts to the right (BP_1) and the level of output can not expand to match the increase in aggregate demand at the new intersection, the balance of payments can only be restored to equilibrium by cutting absorption, thus instituting a leftward shift in the IS curve. Williamson observes that a leftward shift in the IS curve may be induced by the income redistribution effects of devaluation. Income may be redistributed from the private sector to the public sector through an increase in tax revenue following a movement by tax payers from low to higher income tax brackets that may be induced by inflation. An increase in the price level may also reduce real money balances thereby shifting the LM curve to the left.

Finally, the monetary approach to balance of payments analysis predicts that if there is no change in domestic credit, changes in the money supply must come about through deficits or surpluses in the balance of payments. When a currency is devalued, foreign reserves increase as exports increase, assuming that the Marshall-Lerner conditions hold. Since it is assumed that no sterilization takes place or there are no changes to domestic credit, the increase in foreign reserves implies a surplus. From Figure 1.3, this surplus translates into a shift to the right in the BP and IS curves. As discussed earlier, the incipient rightward movement in the LM curve following an increase in the money supply is offset by an

increase in the price level. The price increase will continue until both the money market and the balance of payments are in equilibrium.

1.4 Hypotheses

The major hypothesis tested in the study is that currency devaluation leads to an improvement in the trade balance and balance of payments. However, empirical analyses of the effects of currency devaluation in several studies are based on three major theoretical approaches to balance of payments presented in the preceding section. From each of these theoretical models, testable hypotheses in support of the major hypothesis are formulated.

1.4.1 The Real Exchange Rate Effect

Although the three approaches to balance of payments analysis have different assumptions, they are all based on a common theoretical relationship between nominal and real exchange rates; that is, currency devaluation will not lead to an improvement in balance of payments unless the associated increase in the nominal exchange rate (units of domestic currency per unit of foreign currency), leads to an increase in the real exchange rate. It is thus hypothesized that currency devaluation will lead to an increase in the real exchange rate.

1.4.2. Effect of Currency Devaluation on Trade Balance

The elasticities model predicts that currency devaluation in a small and dependent open economy, will improve trade balance as long as the sum of the demand elasticities for imports and exports exceeds unity. The stipulation that the sum of the import demand and export demand elasticities exceeds one, also referred to as the Marshall-Lerner condition, ensures that the sum of the changes in both exports and imports sufficiently offset a decline in the exchange rate to improve total revenue in the trade balance (Ulbrich 1983). Since Malawi's trade volume, relative to the world market, is small, we can consider its economic behavior as being consistent with the Marshall-Lerner condition. In the light of this stipulation,

we can hypothesize that Malawi's trade balance will respond positively to a currency devaluation.

1.4.3. The J-Curve Effect on Trade Balance

A lag in the adjustment of exports and imports is one factor that is presumed to delay the responsiveness of trade balance to a currency devaluation. Economic agents may delay their adjustment to a change in the exchange rate due to several factors which include fixity of contracts, lengths of production cycles, government intervention and some rigidities in the economic system. Some, if not most of these mitigating circumstances are prevalent in many developing countries, including Malawi. It is therefore hypothesized that the apparent failure to observe an immediate improvement in the trade balance in Malawi, and in other countries of the Sub-Saharan Africa is associated with the J-Curve effect.

1.4.4. Exchange Rate and Price Transmission Effect

For the real exchange rate to influence producers' and consumers' decision making, signals of price incentives must be transmitted throughout the economy. A unitary elasticity of price transmission or pass-through implies that changes in the exchange rate and foreign prices are completely transmitted to the domestic economy, whereas a less than unitary elasticity implies a less than perfect transmission. Since the elasticities approach assumes the existence of perfect competition, and considering the size of Malawi's economy in the global market, we can hypothesize that exchange rate and price transmission elasticities are not significantly different from one.

1.4.5. Expenditure Switching Effect

The absorption approach defines current account balance (trade balance plus balance on services and transfer payments) as the difference between aggregate income and expenditure. Thus a devaluation can improve the current account and hence the balance of payments, by reducing aggregate expenditure or by causing consumers to switch expenditure from traded goods (imports and exports) to non-traded domestic goods. The latter effect is of particular interest since it is expected to improve the current

account balance by directly reducing the volume of imports. Thus we hypothesize that currency devaluation improves the balance of payments due to the expenditure switching effect.

1.4.6. Price and Exchange Rate Effects on the Balance of Payments

Finally, the monetary approach to balance of payments analysis focuses on the interaction between the external sector and the monetary side of the economy. Using the assumptions of purchasing power parity, perfect capital mobility and perfect arbitrage, the model predicts that a nominal devaluation will have a one to one effect on domestic prices. Under these circumstances, it can be hypothesized that a devaluation will generate an increase in the demand for money which will in turn lead to a temporary improvement in the balance of payments, as long as domestic credit is kept constant. This theoretical premise has been the basis for the IMF and the World Bank to continue to recommend currency devaluation as the major instrument for structural adjustment in spite of limited applicability of the underlying assumptions.

1.5 Methodology and Thesis Outline

A few of the studies that have analyzed exchange rate effects on economic performance in Africa (Gulhati et al., Tshibaka 1989, and Oyejide 1986) have applied partial equilibrium procedures which ignore the influence of macroeconomic effects on a devaluation. Considering that currency devaluation is usually administered amidst fiscal, monetary, and commercial policies, a general equilibrium (GE) analytical framework would be the most preferred approach to other alternatives. However, because the GE models use aggregate data to estimate parameters, sector specific effects of a devaluation may not be easily exposed. Against this background, both the partial equilibrium and general equilibrium approaches will be used to analyze the effects of exchange rate changes on the trade balance and balance of payments.

Parameter estimates for testing respective hypotheses will be determined using econometric procedures. The study comprises five main parts. Part I constitutes the introductory chapter. Part II with Chapters 2, 3 and 4, uses the partial equilibrium framework to test the first four hypotheses. Chapters 2

and 3 focus on the effect of currency devaluation on the real exchange rate and the structure of Malawi's exchange rate and price transmission or pass-through. In Chapter 4, the effect of currency devaluation on trade balance, through the J-Curve phenomenon is examined.

Part III, with Chapters 5 and 6 applies the absorption approach to the balance of payments analysis. Chapter 5 tests the expenditure switching effect of a devaluation, whereas Chapter 6 adapts a two good Mundell-Fleming model to analyze the effects of currency devaluation and several macro policies on the performance of Malawi's economy.

Part IV focuses on the effect of a devaluation on the balance of payments using the monetary approach to the balance of payments analysis. In essence, Part IV is an attempt to evaluate the relevance of the monetary model of balance of payments in an African country such as Malawi. Finally Part V summarises issues raised in the preceding chapters.

1.6 Bibliography

Alexander, S. S. "Effects of a Devaluation on Trade Balance". *IMF Staff Papers*, 2:(1952): 263-278.

Economics, 13(1980):82-95.

Bredahl, M. E. "Effects of Currency Adjustment Given Free Trade, Trade Restrictions and Cross Commodity Effects." *Department of Agriculture, Economic Staff Papers*. St. Paul: University of Minnesota, 1976, pp76-35.

Carbaugh, R. J. *International Economics*. Cambridge, Massachusetts: Winthrop Publishers, Inc, 1980.

Chambers, R. G., and R. E. Just. "Effects of Exchange Rate Changes on U.S Agriculture: A Dynamic Analysis". *American Journal of Agricultural Economics*, 63(1981):32-46.

_____ , "A Critique of Exchange Rate Treatment in Agricultural Trade Models." *American Journal of Agricultural Economics*, 66(1984):249-57.

Cooper, R. *Exchange Rate Devaluation in Developing Countries. Princeton Essays in International Finance 58*. Princeton, N.J: Princeton University Press, 1971.

Dernburg, T. F. *Global Macroeconomics*. New York: Harper and Row, 1989.

Diaz-Alejandro, Carlos. F. *Exchange Rate Devaluation in a Semi-Industrialized Economy: The Experience of Argentina, 1955-61*. Cambridge, MA: MIT Press, 1965.

Dornbusch, R., S. Fischer, and G. Sparks. *Macroeconomics*. Toronto: McGraw-Hill Ryerson Limited, 1981.

Edwards, S. "Commodity Export Prices and Real Exchange Rate", in *Economic Adjustment and Exchange Rate in Developing Countries: Coffee in Columbia*, eds. Edwards. S, and L. Ahamed. Chicago: University of Chicago Press, 1986.

_____ , Exchange Rate Misalignment in Developing Countries." *Research Observer*, 6(1989):3-20.

Gulhati, R., S. Bose, and V. Atukorala. *Exchange rate Policies in Eastern and Southern Africa, 1965 - 1983. World Bank Staff Working Papers, No. 720*. Washington, DC: World Bank, 1985.

Grennes, T. *International Financial Markets and Agricultural Trade*. Boulder: Westview Press,

1990.

Hume, S. D. "Hume's Essays of the Balance of Trade", in *International Finance*, ed. Cooper, R.N. London Penguin, 1969.

Jansen, D. *Trade, Exchange rate, and Agricultural Pricing Policies in Zambia*. World Bank Comparative Studies. Washington, DC: The World Bank, 1988.

Johnson, H. G. "The Monetary Approach to Balance of Payments Theory." *Journal of Financial and Quantitative Analysis* 7(1972):1555-1572.

Kreinin, E. M., and L. H. Officer. *The Monetary Approach to the Balance of Payments: A Survey."* New Jersey: International Finance Section, Department of Economics, Princeton University, 1978.

Kydd, J., and A. Hewitt. "The Effectiveness of Structural Adjustment Lending: Initial Evidence from Malawi". *World Development*, 3(1986):347-65.

McCracken, J. "Share-Cropping in Malawi: The Visiting Tenant System in the Central Province, Circa 1920-68". Paper presented at the University of Edinburgh, May 1984, quoted in Mead, J. *The Theory of International Economic Policy, vol. 1: The Balance of Payments*. London: Oxford University Press, 1951.

Mundell, R. A. *Monetary Theory*. Palisades, Calif: Good Year, 1971.

Nyasaland Government. *The Jack Report*. Zomba: Government Print, 1959.

Office of the President and Cabinet, Department of Economic Planning and Development. *Statement of Development Policies 1987-1996*. Zomba: Government Printer, 1987.

_____ , Department of Economic Planning and Development, Malawi Government. *SAL IV. Adjustment with Growth and Development: A Proposed Fourth Structural Adjustment Programme*. Lilongwe, 1987.

Oyejide, T. A. *The Effects of Trade and Exchange Rate Policies on Agriculture in Nigeria*. Research Report No.55. Washington, DC: International Research Institute, 1986.

Paarlberg, P. L., and R. G. Chambers. *Macroeconomics, Agriculture, and Exchange Rates*. Boulder Westview Press, 1988.

Polak, J. J. "Monetary Analysis of Income Formation and Payments Problems". IMF Papers, November 1957. Reprinted in International Monetary Fund, The Monetary Approach to the Balance of Payments, ed. Rhomberg, R. R, and H. R. Heller. Washington DC: IMF, 1977.

Rauser, G. C. *Macroeconomics and U.S Agricultural Policy*. Studies in Economic Policy, American Enterprise Institute, 1986.

Salter, W. "Internal and External Balance: The Role of Price and Expenditure Effects." *Economic Record*, 35(1959):226-38.

Schuh, E. G. "The Exchange Rate and U.S Agriculture." *American Journal of Agricultural Economics*, 56(1974):1-3.

Silumbu, B. D. "The Role of the Exchange Rate and Monetary Policy in the Monetary Approach to the Balance of Payments: Evidence from Malawi". Paper Presented at the African Economic Research Consortium (AERC) Workshop, May 24 - 28, Nairobi, Kenya, 1992.

Swan, T., "Longer-Run Problems of Balance of Payments", in *The Australian Economy: A Volume of Readings*, ed. H. Arndt and M. Corden. Melbourne: Cheshire Press, 1963.

Thirlwall, A. P. *Balance of Payments Theory and the United Kingdom Experience*. London and Basingstoke: The Macmillan Press Ltd, 1980.

Tshibaka, T. B. *The Effects of Trade and Exchange Rate Policies on Agriculture in Zaire*. Research Report No.56. Washington, DC: International Research Institute, 1986.

Ulbrich, H. *International Trade and Finance: Theory and Policy*. Englewood Cliffs, NJ: Prentice-Hall, Inc, 1983.

United States Department of Agriculture, Economic Research Service. *Agricultural Policy, Trade, and Development*. Washington, DC: Agricultural Trade Analysis Division, 1989.

Vellianitis-Fidas, A. "The Impact of Devaluation on U.S Agricultural Exports." *Agricultural Economic Research*, 28(1976), No 3.

Wijnbergen, S. "Stagflation Effects of Monetary Policies: A Quantitative Analysis of South Korea." *Journal of Development Economics*, 10(1982):133-69.

Williamson, J. *The Open Economy and the World Economy*. New York: Basic Books Inc, 1983.

Part II

Elasticities Approach to Balance of Payments Analysis

Chapter 2

The Effect of Currency Devaluation on the Real Exchange Rate

2.1 Introduction

Currency devaluation is expected to improve external competitiveness by altering the opportunity cost of resources in the traded goods sector relative to non-traded goods sector. The apparent failure of the exchange rate policy to lead to an improvement in the trade balance and balance of payments may be partly attributable to the failure of the economic system to effect a comparable change in the real exchange rate (RER). Reference has been made in many policy discussions to stability in the real exchange rate and to correct exchange rate alignment as crucial conditions to improve economic performance in less developed countries (LDCs) Krueger (1983). Cottani, Cavallo, and Khan (1990) have also observed that there is a strong link between RER behaviour and economic performance, at least in some Latin American, Asian, and African countries. Thus, there is a need to evaluate the effects of a change in the nominal exchange rate on the real exchange rate in order to ascertain the effectiveness of a devaluation on resource allocation and the balance of payments.

2.2 Objective

The primary objective of this chapter is to analyze the impact of a nominal devaluation on the real exchange rate. Although the real exchange rate is directly linked to the nominal exchange rate, there are other factors such domestic credit, the terms of trade, net capital flows, foreign aid and technology that seem to influence its behavior (Edwards 1989). Unless these factors are incorporated into the analysis, the impact of a nominal devaluation on the real exchange rate may be underestimated. The secondary objective of this chapter is therefore to analyze the impact of changes in the domestic credit, terms of trade, capital flows and technology on the real exchange rate. In order to pursue the two objectives, it is necessary to survey the definitions and concept of the real exchange rate.

Although currency devaluation has become a major issue in policy debates in the Sub-Saharan

Africa, little attention has been paid to understanding the effect of nominal exchange rate changes on relative prices or real exchange rate. Empirical evidence reviewed in a literature survey by Edwards strongly suggests that nominal devaluations, if supplemented by appropriate macroeconomic policies, can generate a real depreciation and improve the external position of the country. Edwards' observation regarding the complementary effect of appropriate macroeconomic policies on currency devaluation, has been further supported by Cooper's (1971) study. In addition Cooper observes that nominal devaluations have a short term effect on the real exchange rate. The limited responsiveness by the real exchange rate to nominal currency devaluations is also supported by Connolly and Taylor (1976, 1979), Donovan (1981), Bautista (1981), Morgan and Davies (1982), and Edwards (1985).

2.3 The Real Exchange Rate: A Conceptual Framework

The real exchange rate measures the degree of competitiveness between domestically produced goods and goods produced in the rest of the world. Traditionally, the real exchange rate has been defined as the nominal exchange rate adjusted for changes in domestic and foreign prices;

$$RER = \frac{eP^*}{P} \tag{2.1}$$

where P and P^* are domestic and foreign price deflators, respectively, and e is the nominal exchange rate in terms of domestic currency per unit of foreign currency. This definition is based on the principal of purchasing power parity (PPP) between one country and another. The PPP-based definition of RER attempts to incorporate the effects of domestic and foreign inflationary pressure on the real exchange rate measure. In essence, a real appreciation in the real exchange rate, with respect to what would be considered "an equilibrium year", reflects an overvaluation in the domestic currency and a loss in international competitiveness (Diakosavvas and Kirkpatrick 1990). Inadvertently, the loss in international competitiveness reduces export revenue and therefore creates a deficit in the balance of payments. Under such circumstances, currency devaluation is considered the most appropriate instrument for restoring an equilibrium in the balance of payments account.

Although the PPP paradigm is intuitively appealing, it has not been sufficiently supported by empirical evidence (Edwards). Diakosavvas and Kirkpatrick observe that perfect commodity arbitrage, upon which the PPP theory is predicated, does not occur in some countries. In addition, general price indices which are used to compute the PPP-based real exchange rate index are not directly comparable across countries due to differences in productivity (Williamson 1983).

Recent developments in international trade literature (Salter 1959 and Swan 1960) have led to another definition of the real exchange rate. Swan and Salter define the real exchange rate as the product of the nominal exchange rate and the ratio of traded to non-traded goods prices, i.e.,

$$RER = \frac{eP_T^*}{P_N} \tag{2.2}$$

where P_T^* and P_N represent the world price of traded goods, and the domestic price of non-traded goods respectively. Assuming that $P_T = eP_T^*$, and that a fixed exchange rate mechanism prevails, the real exchange rate is simply a ratio of traded to non-traded goods prices, denominated in domestic currency,

$$RER = \frac{P_T}{P_N}. \tag{2.3}$$

The Swan-Salter definition of real exchange rate assumes the existence and context of a dependent and small open economy which has no control over world market prices. Since the price for tradable goods is exogenously determined by world market forces, the foreign demand for exports and supply of imports are perfectly elastic. An increase in the real exchange rate is expected to induce a price increase in tradables and a reallocation of resources from non-traded goods sector to traded goods sector. The resource reallocation between the two sectors is expected to lead to an increase in the supply of tradable goods and an improvement in the balance of payments.

One problem encountered in attempting to measure the real exchange rate is the choice of the nominal exchange rate variable. The nominal exchange rate is normally quoted in units of domestic currency per unit of a principal trading partner's currency, such as the United States Dollar or the British

Pound Sterling. However, the use of bilateral exchange rates in assessing a country's competitiveness is misleading since it may not adequately reflect the economic behaviour of other important trading partners. For these reasons, several researchers, including Edwards, have used a trade-weighted exchange rate which is also referred to as the effective exchange rate. Edwards expresses the effective real exchange rate as:

$$ERER_{jt} = \frac{\sum_{i=1}^{k} \alpha_i E_{it} P_{it}^{*}}{P_{ij}}, \qquad (2.4)$$

where $ERER_{jt}$ is the index for the multilateral real exchange rate in period t, for country j; E_{it} is an index of the nominal exchange rate between country i and country j; i = 1,..., k refers to the k partner countries used in the construction of the effective real exchange rate; α_i is the weight corresponding to partner i; P_{it}^{*} is the price index for partner i in period t; and P_{jt} is the domestic price index in period t.

Another problem related to the measurement of the real exchange rate pertains to the choice of price indices for the tradable and non-tradable goods. Kravis and Lipsey (1983) have proposed the use of the GDP deflator for services and government as a proxy for non-tradable goods price and deflators for the rest of the economy as a proxy for the traded goods price. The problem of using these deflators as proxies for traded and non-traded goods prices is that the existing disaggregation at the national account level in most developing countries is too broad to permit meaningful comparisons across sectors (Edwards).

The foreign wholesale price index (WPI) and the domestic consumer price index (CPI) have been used by some researchers as alternative proxies for the traded goods and non-traded goods prices, respectively (Harberger 1986). The advantage of using the foreign wholesale price index or a trade weighted average WPI is that it includes a considerable portion of traded goods. However, Officer (1986) argues that the real exchange rate developed from the WPIs may fail to measure actual changes in the degree of competitiveness because the goods that it represents are not homogeneous.

Major weaknesses with regard to the use of the CPI as a proxy for the non-traded goods price have also been cited by Diakossavas and Kirkpatrick. According to Diakossavas and Kirkpatrick the CPIs predominantly represent the urban areas even though they include a large number of tradable goods. The

GDP deflator, as proposed by Harberger, appears to be the most appropriate proxy for the non-tradable goods price. Although the GDP deflator fails to capture inflation rates except where wages are indexed, it is considered invariant to distortions induced by price controls (Harberger).

Notwithstanding the weaknesses of the various indices addressed above, the historical pattern of Malawi's external competitiveness is analyzed using three real exchange rate measures presented in the preceding section, i.e., the bilateral real exchange rate, the relative price between traded and non-traded goods, and the effective real exchange rate. The study uses trade weighted wholesale price index and the GDP deflator as proxies for the traded goods and non-traded goods prices, respectively. Countries whose currencies were used to compute the effective exchange rate include the United States of America, United Kingdom, Germany, South Africa, Zimbabwe and Zambia. The proxy for traded goods price index, in terms of domestic currency, is computed as a weighted average of the export and import unit prices; i.e.,

$$P_T = \alpha P_x + (1-\alpha) P_M \qquad (2.5)$$

where α represents the share of exports in the total trade volume.

2.4 Behaviour of the Nominal and Real Exchange Rates in Malawi

Before independence, Malawi used the British pound as currency. By virtue of colonial and trade ties, the post-independence currency, the Malawi Kwacha, MK, was pegged to the British pound. From 1973 to 1975, the Kwacha was pegged to a weighted average of the United States dollar, $, and the British pound, £. Thereafter, it was pegged to the Special Drawing Rights, SDR, and a basket of currencies representing Malawi's major trading partners.

As can be observed from Figure 2.1, all real exchange rate measures indicate that Malawi's exchange mechanism has been stable relatively since 1965. Two of the real exchange rate measures, the bilateral Malawi-US measure and the ratio of the relative price indices P_T to P_N suggest that the Malawi Kwacha was slightly overvalued prior to the 1973 peg to the US Dollar and the British Pound. However, the effective real exchange index appears to indicate that the Kwacha was undervalued between 1965 and 1971 and from 1973 to 1975.

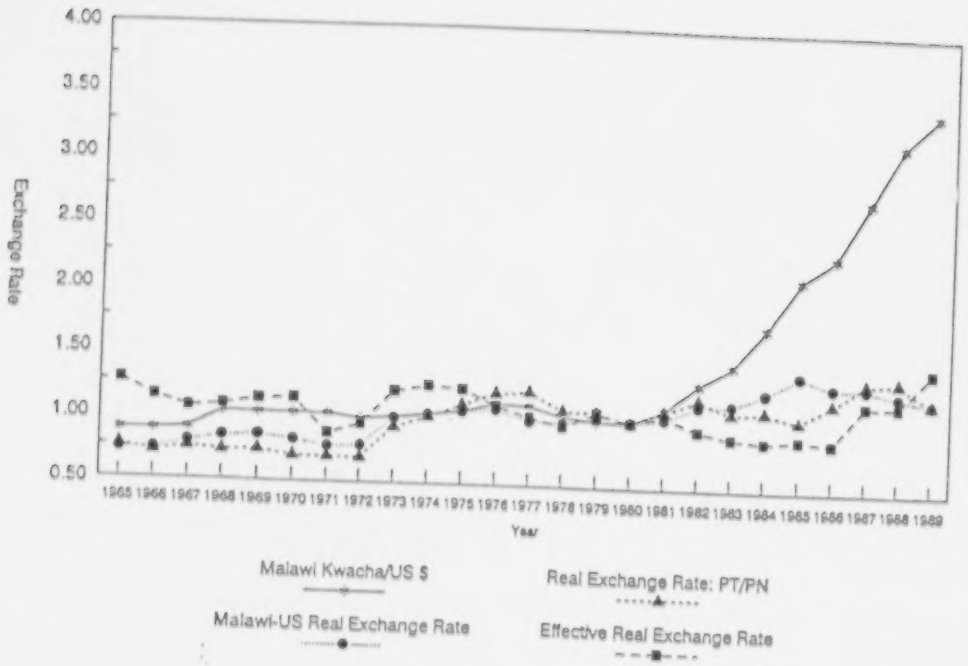

Figure 2.1 Nominal and Real Exchange Rates in Malawi, 1965-1989.

Source: Derived from Malawi's Annual Statistics, 1964 - 1990.

The behavior of the real exchange rate in the 1980s, as depicted by the three indices, is of particular interest. Successive nominal devaluations, implemented as part of the structural adjustment programme, do not appear to have led to a real devaluation of the Malawi Kwacha, as measured by the effective real exchange rate. In fact, the Kwacha appears to have appreciated between 1981 and 1987 as measured by the relative price index and the effective real exchange rate in spite of successive devaluations over the

same period.

Similar observations with respect to the failure of the nominal devaluations to lead to a real devaluation between 1982 and 1989 have been made by Sahn, Arulpragasam and Merid (1990). The study by Sahn et al., indicates that Malawi's real effective exchange rate appreciated sharply following successive devaluations of 15 per cent in 1982, and 12 per cent of 1983. Malawi had to devalue its currency again in 1984 following a change in the pegging system to a basket of her major trading partners' currencies. Sahn et al., partly attribute the apparent failure of the nominal devaluation to lead to a real devaluation to an increase in Malawi's inflation rate.

The behavior of Malawi's real exchange rate in Figure 2.1 does not appear to support the hypothesis that successive nominal devaluations lead to a real devaluation in the domestic currency. Figure 2.1 also demonstrates that the bilateral real exchange rate and effective real exchange rate do not necessarily move in the same direction. The divergence between the bilateral real exchange rate and the effective real exchange rate has also been documented by Edwards and Ng (1985) in a similar study of developing countries.

2. 5 Model Selection

According to Edwards (1988), a country's real exchange rate is influenced by both external and domestic factors. These factors include international terms of trade, international transfers or aid, world real interest rate, trade policies, exchange and capital controls, the composition of government expenditure, and technological progress.

The rationale for including the international terms of trade is that large fluctuations in real exchange rates, especially in the 1970s were largely due to foreign price shocks (Cottani et al). Cottani et al., cite the 1973 increase in oil prices as an important factor that led to massive real currency devaluations of oil importing nations and appreciation of the currencies of oil exporting nations.

An appreciation in the foreign currency is expected to result in an increase in the price of imports relative to the price of exports, thereby causing a deterioration in the terms of trade. Since the price of

traded goods is defined as a weighted average of the export and import price indices, a deterioration in the terms of trade is expected to lead to an increase in the real exchange rate.

Deviation of the real exchange rate from its equilibrium level may also be induced by an increase in domestic credit, holding the nominal exchange rate fixed. The domestic credit may influence the value of the real exchange rate through its inflationary effect on the economy. Assuming that perfect arbitrage holds, and that the elasticity of real money balances with respect to income is unitary, an increase in the money supply, associated with an increase in domestic credit, is expected to induce an appreciation in the real exchange rate.

The real exchange rate is also likely to appreciate following: an increase in net capital flows. Net capital flows represent a net increase in foreign borrowing, transfers, and aid, minus net factor payments caused by any or a combination of the following; an autonomous increase in grants, a reduction in world interest rates, the removal of domestic capital controls, an increase in public borrowing to finance a fiscal deficit, and an exogenous increase in voluntary lending by foreign creditors. An increase in net capital flows is expected to lead to an increase in the money supply and to stimulate consumption of non-tradable goods. The real exchange rate is therefore expected to fall as the price for non-traded goods rises due to an excess demand.

Trade policy restrictions, such as tariffs and quotas on exported and/or imported goods, are expected to cause a reduction in the volume of trade. An increase in import or export tax, for example, may raise the domestic price of traded goods relative to non-traded goods. Following the increase in the prices of imports and exports, the quantity of tradable goods that is demanded is likely to decline, whereas the quantity of non-traded goods that is demanded is likely to rise. The rise in the price of non-traded goods is expected to result in an appreciation of the real exchange rate.

Technological factors may affect the real exchange rate through an increase in productivity. Balasa (1964) observes that productivity improvements in rapidly growing economies tend to be concentrated in tradable sectors and usually account for a fall in the real exchange rate.

Several model specifications of the real exchange rate, as a function of factors discussed in

Edwards' survey, have been estimated in various studies. Some of these model specifications can be found in the works of Krueger, Schiff and Valdes (1988); Valdes, Hurtado, and Muchnik (1990); Mundlak, Cavallo and Domenech (1990); Diakosavvas and Kirkpatrick; Cottani, Cavallo, and Khan.

In one of the studies, Edwards specifies a percentage change in the real exchange rate as a function of percentage changes in the nominal exchange rate, the rate of growth in the domestic credit, and changes in the ratio of fiscal deficit to GNP. Although the results obtained from Edwards' study indicate that a 10 per cent nominal devaluation results in a 7 per cent real devaluation in the first year, the model used in the estimation does not include the effect of the terms of trade, capital flows and quantitative restrictions.

In a similar study by Cottani et al., the real exchange rate is specified as a function of the terms of trade, the ratio of income to the sum of imports and exports, net capital inflow as a ratio of GDP, and domestic credit creation in excess of devaluation, foreign inflation, and real GDP growth; i.e.,

$$EFER_t = \beta_0 + \beta_1 DOC_t + \beta_2 TOT_t + \beta_3 QTR_t + \beta_4 KFL_t + \beta_5 T + \varepsilon_t , \qquad (2.6)$$

where $EFER_t$ is the effective real exchange rate, DOC_t is the level of domestic credit as a proportion of GDP, TOT_t is a ratio of the export price index to the import price index, P_X/P_M; QTR_t is a ratio of income to the sum of exports and imports $(Y_t/(X_t + M_t))$; KFL_t is net capital flow, measured as the difference between net change in foreign reserves and trade balance, weighted by GDP; T is time trend, a proxy for technology; ε_t is a disturbance term; and β_i are parameters to be estimated. Although this model does not directly estimate the effect of nominal devaluation on the real exchange rate, it incorporates most of the domestic and foreign factors that have been used in many studies to explain the real exchange rate behaviour in developing countries.

In this study, a modification of the model applied by Cottani et al. is used to test the hypothesis that nominal devaluations have a positive effect on the real exchange rate. A percentage change in the nominal exchange rate, DEV, is introduced in the modified model to capture the effect of a nominal devaluation on Malawi's real exchange rate. Rigidity in the real exchange rate adjustment is captured through the Nerlovian partial adjustment model. Assuming that REFR* represents the equilibrium effective

real exchange rate, the stock adjustment model postulates that:

$$REFR_t - REFR_{t-1} = \lambda(REFR_t^* - REFR_{t-1}) \qquad (2.7)$$

where $REFR_t - REFR_{t-1}$ represents the actual change, and $REFR_t^* - REFR_{t-1}$, represents the desired change, and γ is known as the coefficient of adjustment, such that $0 < \gamma < 1$. The actual change in the effective real exchange rate in equation (2.7) is some fraction γ of the optimal change in the equilibrium effective real exchange rate. The actual effective real exchange rate fully adjusts to the equilibrium real exchange rate if $\gamma = 1$. However, no adjustment in the real exchange rate between one time period and another occurs when $\gamma = 0$. The estimating equation incorporating the partial adjustment process is as follows:

$$EFER_t = \gamma\beta_0 + \gamma\beta_1 DOC_t + \gamma\beta_2 TOT_t + \gamma\beta_3 QTR_t + \gamma\beta_4 KFL_t + \gamma\beta_5 DEV + \gamma\beta_6 T + (1-\gamma)EFER_{t-1} + \varepsilon_t, \qquad (2.8)$$

where $EFER_t$ is the effective real exchange rate as defined earlier, DOC_t is the level of domestic credit as a proportion of GDP, TOT_t is the ratio of the export price index to the import price index, P_X/P_M, QTR_t is the ratio of income to the sum of exports, plus imports; $(Y_t/(X_t + M_t))$, KFL_t is net capital flow, measured as the difference between net change in foreign reserves and trade balance, weighted by GDP, DEV is a percentage change in the nominal exchange rate, $EFER_{t-1}$ is the lagged effective real exchange rate, T is time trend, a proxy for technology, ε_t is a disturbance term, β_i are parameters to be estimated, and γ is a partial adjustment parameter.

Estimation of equation (2.8) yields short term coefficients. Long term coefficients may be derived by solving for γ from the coefficient of the lagged dependent variable and dividing the rest of the coefficients by the estimate of the partial adjustment parameter.

The terms of trade index, TOT_t, is measured as a ratio of export price index to the import price index. As discussed earlier, a deterioration in the terms of trade is expected to lead to an increase in the real exchange rate. The ratio of income, Y_t, to trade volume, $(X_t + M_t)$, has been used as a proxy for quantitative restrictions by Cottani et al., and Ghura, and Greenes (1991). An increase in trade restrictions, through tariffs, quotas and exchange controls, makes an economy less open to international

trade, and this is reflected in the reduction of imports and exports and therefore an increase in $(Y_t/(X_t + M_t))$. The reduction in openness exerts a downward pressure on the price of traded goods relative to non-traded goods, thus causing a decline or an appreciation in the real exchange rate.

Net capital flows, $KFLO_t$, reflects a difference between net change in foreign reserves and trade balance, whereas the variable DEF_t, represents domestic credit as a proportion of GDP. The effect of technology on the real exchange rate is captured by a time trend, T.

2.6 Data

The data used in the analysis comprise 24 annual observations of trade and macroeconomic variables, from 1965 to 1988. These include exchange rates with respect to the United States Dollar, trade volumes and wholesale price indices for Malawi, the United Kingdom, Germany, South Africa, Zimbabwe, and Zambia; export and import price indices, foreign reserves, domestic credit, domestic income, GNP, and gross domestic product, GDP.

Sources of the data include publications of the Malawi Government, the Reserve Bank of Malawi, Malawi's Parastatal Organizations, the World Bank, and the International Monetary Fund (IMF).

2.7 Empirical Analysis and Results

Empirical estimation was preceded by selection of the functional form using Box-Cox transformation. The classical Box-Cox model stipulates that for a variable $y = y_1 \ldots y_n$:

$$y_t^{(\lambda)} = \begin{cases} \dfrac{y_t^{\lambda}-1}{\lambda} & \lambda \neq 0 \\ \ln y_t & \lambda = 0 \end{cases}, \qquad (2.9)$$

where $0 < \lambda < 1$. Thus a model $y^{(\lambda)} = x^{(\lambda)} \beta$ is transformed into a linear functional form when λ is one, and a double logarithmic functional form when λ is zero, and a semi-logarithmic functional form when only the dependent side λ is zero and the rest are one. A log-likelihood ratio statistic was used to test the hypotheses that the maximum likelihood values of the linear and semi-logarithmic functional forms were

not significantly different from the maximum likelihood values of the un restricted model. Table 2.1 presents results of the test. The estimated test statistics reject hypothesis that the maximum likelihood function of the linear model is not significantly different from maximum likelihood function of the unrestricted maximum likelihood value; but do not reject the hypothesis that the maximum likelihood value of the semi-logarithmic functional form is not significantly different from the maximum likelihood value of the unrestricted model. Thus the semi-logarithmic functional form is applied in the analysis.

Table 2.1. Box-Cox Test for Functional Form

Models	Log-likelihood Value	LRT	No of Restrictions	[1]Log-Likelihood Ratio Test	Critical χ^2 Value
MLE Lamba	53.795				
Lambda = 1	49.590	8.410	1		
Lambda = 0	53.101	1.388	1	3.978	3.842

Static and dynamic versions of equation (2.8) were estimated following White (1994). In order to overcome the problem of degrees of freedom arising from overparameterization, the real exchange models were estimated using the maximum likelihood (ML) method. According to Gujarati (1988), the ML estimator of σ^2 is $\Sigma e_i^2/N$ regardless of the number of variables in the model, whereas the OLS estimator is not. The estimated parameters are asymptotically significantly different from zero at 95 per cent confidence level if they are approximately two standard errors in value.

Results of the empirical estimation are presented as elasticities[2] in Table 2.2.

---

[1]The following formula was used to estimates the log-likelihood ratio statistic as discussed in White (1994): $2(\ln\lambda_{Ha} - \ln\lambda_{Ho}) \sim X^2(1)$, where, λ_{Ha}, and λ_{Ho} represent maximum log-likelihood functions for the null and alternative hypotheses, respectively.

[2]Elasticity for a semi-log model is expressed as $\frac{\partial \log Y_t}{\partial X_t}\frac{X_t}{Y_t} = \frac{\partial Y_t}{\partial X_t}X_t$.

Table 2.2. Estimates of the Real Exchange Rate Determinants, 1965-1988

	Static		Dynamic (Short Run)		Dynamic (Long Run)	
Variable	**Estimate**	**S.E**	**Estimate**	**S.E**	**Estimate**	**S.E**
Constant	0.982*	0.100	0.712*	0.100	0.838*	0.100
DOC	-0.115*	0.021	-0.122*	0.014	-0.141*	0.020
TOT	-0.095*	0.040	-0.089*	0.030	-0.128*	0.068
QTR	-0.996*	0.095	-0.881*	0.088	-1.104*	0.104
KFL	-0.039*	0.016	-0.054*	0.013	-0.069*	0.021
DEV	0.021*	0.004	0.023*	0.003	0.019*	0.004
$EFER_{t-1}$	-	-	0.227*	0.054	-	-
γ	-	-	-	-	0.772*	0.068
T	0.116*	0.018	0.084*	0.023	0.085*	.024
DW	2.282		1.766			
Adj R^2	0.901		0.857			

DOC = Ratio of domestic credit to GDP;
TOT = Terms of trade;
QTR = Ratio of GDP to the sum of total imports and exports;
KFL = Difference between reserves and trade balance, weighted by GDP;
DEV = Percentage change in nominal exchange rate;
$EFER_{t-1}$ = Lagged effective real exchange rate;
T = Time trend;
ADJ R^2 = Adjusted R^2;
* Significant at the 95 per cent confidence level;
** Significantly different from zero at 90 per cent confidence level; and
Figures in parentheses are standard errors.

As discussed earlier, dividing the short run estimates by the partial adjustment coefficient yields long run parameter estimates. Since the elasticity estimates are a continuous nonlinear function of the estimated parameters and independent variables, their standard errors are obtained from following weighted variance-covariance expression, as discussed in White (1993), i.e.,

$$\sqrt{\left[\left(\frac{\partial h(\beta)}{\partial \beta}\right) V(\beta) \left(\frac{\partial h(\beta)}{\partial \beta}\right)'\right]} \qquad (2.10)$$

where β is a matrix of parameter estimates and relevant variables, defining the elasticity estimate, and $V(\beta)$ is the associated variance-covariance matrix.

With the exception of technological progress, as measured by the time index T, the estimated elasticities have the expected theoretical signs and are significantly different from zero at 95 per cent confidence level. As indicated by the log-likelihood ratio test (LRT) in Table 2.3, the estimates of the static and dynamic models are not significantly different from each other. Thus, hypothesis testing and inference can be based on either model. The magnitude of the estimated adjustment parameter is high (approximately 0.80), implying that most of the adjustments in the real exchange rate occur in the current year.

Table 2.3. Log-Likelihood Ratio Test: Static Models versus Dynamic Model

	Static	**Dynamic (Short Run)**	Critical χ^2 Value
LLF	51.361	51.813	3.842
LRT: Static vs Dynamic Model		0.904	

LLF = Value of the log likelihood function; and
LRT = Likelihood ratio statistic.

The main hypothesis tested is that nominal devaluations lead to a depreciation in the effective real exchange rate. The parameter estimate with respect to the devaluation variable, DEV, indicates that a change in the nominal exchange rate has a small but significant positive effect on the effective real exchange rate. Hence the hypothesis that a nominal devaluation leads to a real devaluation can not be rejected. A one per cent increase in the nominal exchange rate is associated with approximately 0.02 per cent increase in the real exchange rate.

Theory underlying the exchange rate model predicts that domestic credit, quantitative restrictions, and the terms of trade have a negative effect on the real exchange rate. The results in Table 2.2 support the posited hypotheses. In terms of magnitude, the variable proxying trade restrictions appears to exert

the greatest negative effect on the effective real exchange rate in the short run, followed by domestic credit and the terms of trade. A one per cent increase in trade restrictions would lead to a reduction (an appreciation) in the effective real exchange rate by 0.88 per cent and 1.1 per cent in the short-run and long-run, respectively, whereas the same increase in domestic credit and the terms of trade would result in approximately 0.1 per cent appreciation in the real exchange rate in both the short run and the long run. A one per cent increase in capital flows appears to generate approximately 0.05 per cent and 0.07 per cent appreciation in the real exchange rate in the short run and the long run, respectively.

The hypothesis that technological progress would have a negative effect on the real exchange rate is not supported by results in Table 2.2. A similar observation has been made by Cottani et al, in a related study involving several developing countries including Bolivia, Jamaica, Malaysia, Singapore, Somalia, Thailand, Zambia, Senegal and Cameroon. According to Diakosavvas and Kirkpatrick, the impact of an increase in productivity on the real exchange rate can either be positive or negative depending on the extent of expenditure growth on traded and non-traded goods. The two authors argue that the real exchange rate will tend to depreciate if the expenditure growth is biassed towards tradable goods, and vice versa.

The preceding discussion suggests that Malawi's effective real exchange rate, between 1965 and 1988, was mainly influenced by quantitative restrictions, domestic credit, and the terms of trade. Malawi's economy has been described by the World Bank and other International Development Agencies, as being relatively open by developing country standards. However, a recent World Bank's survey on Malawi's incentives and industrial efficiency indicates that the country's domestic prices in 1987 were 36.4 per cent higher, on average, than international prices. The average prices of some groups of goods, such as leather and footwear, were higher than international prices by as much as 73.9 per cent (World Bank 1988). The survey also characterizes Malawi's trade policy, as measured by the nominal protection rate, NPR, as having been more restrictive between 1980 and 1988, relative to the preceding period. Foreign exchange rationing and an increase in tariffs, implemented to mitigate severe balance of payments problems, are partly associated with a rise in protection observed in the 1980s (World Bank). These restrictive measures in part, through their effect on the price of non-tradables, appear to offset the effect of the successive

nominal devaluations of the Malawi Kwacha on the real exchange rate, as shown in Figure 2.1.

The worsening of Malawi's balance of payments position in the late 1970s is partly attributed to an excessive rise in domestic credit (IMF). The increase in domestic credit in the 1970s reflects an increase in the demand for foreign currency induced by oil price shocks and a deterioration of the terms of trade. Until 1987, Malawi's public sector credit substantially exceeded the private sector growth in spite of stringent credit measures instituted as part of the structural adjustment programme in the early 1980s. An expansion in domestic credit increases money supply and therefore causes the real exchange rate to appreciate.

Cottani et al., observe that foreign price shocks such as changes in the terms of trade, accounted for large fluctuations in the real exchange rate of developing countries in the 1970s. A deterioration in the terms of trade is expected to have a similar effect as a devaluation in currency on traded goods since it makes foreign goods more expensive than domestic goods. A reduction in the domestic purchasing power, following a decline in the terms of trade, is expected to have a negative effect on consumption of traded goods which includes domestically manufactured goods and imports. The negative terms of trade coefficient obtained in this study implies that a rise in the terms of trade index translates into an appreciation in the domestic currency. This observation is consistent with theoretical expectations.

The effect of technology on Malawi's effective real exchange rate reflects the size of the economy relative to the world market, and also the level of technological progress during the period covered by the study. The effect of technology on the effective real exchange rate is generated by an output-induced reduction in the price of traded goods. Except for tobacco, Malawi's share of the world commodity market is very small, and the country can therefore be considered as a price taker. Since the price of traded goods is determined on the world market, it is unlikely that any output increases, whether induced by technological progress or other factors, would have a significant effect on the real exchange rate in Malawi. Even if Malawi's share of the world commodity market were significant, it is unlikely that it would have produced sufficient output to influence the price of traded goods under the present level of technology. Empirical evidence from Dean (1966), Kirchiner, Singh, and Squire (1985), and Colman and Garlett (1975)

suggests that Malawi's smallholder farmers respond to relative price incentives. However, Sahn et al., observe that related observed increases in smallholder output was more likely caused by land reallocation other than an increase in productivity. Between 1978 and 1987, the real value added per smallholder farmer increased by only K7.00; i.e., from K131 to K138 (Sahn et al 1990). Similarly, the performance of the estate agriculture appears to be related to increased use of factor inputs such as fertilizer, rather than an increase in total factor productivity.

Capital flows are unlikely to have a major impact on Malawi's real exchange rate in the presence of underdeveloped financial markets and quantitative restrictions. The observation that capital flows appear to have a small but significant impact on Malawi's effective real exchange rate is not surprising. However, foreign aid flows have been used by Valdes as a proxy for capital flow in a similar study. In this study, the effect of foreign aid flow on the effective real exchange rate was not significantly different from zero.

2.8 Conclusion

The purpose of this chapter was to analyze Malawi's real exchange rate behaviour within the context of successive devaluations of the Malawi Kwacha after embarking on the IMF supported Structural Adjustment programme in 1981. The results suggest that successive nominal devaluations had a small but positive effect on Malawi's effective real exchange rate in both the short-run and long-run. The effective real exchange rate appears to adjust to the desired or equilibrium real exchange level with a one year lag. However, a substantial portion of the adjustment appears to take place within the current year. The results also suggest that trade restrictions, or a lack of openness to international trade, exert the greatest negative effect on the real exchange rate, followed by the influence of changes in the terms of trade, domestic credit and capital flows.

The implication of these findings is that for a nominal devaluation to lead to a real depreciation in the effective real exchange rate, quantitative and related trade restrictions should be eliminated and domestic credit controlled. The control of domestic credit requires a reduction in public expenditure and/or a restriction in the growth of money supply. The findings in this study are consistent with observations

made by Edwards that if nominal exchange rate change is accompanied by expansive domestic credit policies, the corrective effect of a devaluation on the real exchange rate will be greatly diminished.

2.9 Bibliography

Balasa, B. 'The Purchasing Power Parity Doctrine: A Reappraisal." *Journal of Political Economy*, 72(1964):584-596.

Bautista, R. "Exchange Rate Changes and LDC Export Performance under Generalized Currency Floating." *Welwirtschafliches Archiv*, 17(3): 443-68.

Colman, and Garlett. *Socio-Economic Survey - Lower Shire Agricultural Development Project*. Zomba: Malawi Government Press, 1976.

Connolly, M., and D. Taylor. "Adjustment to Devaluation with Money and Non-traded Goods." *Journal of International Economics*, 6(1976): 289-94.

_____. "Exchange Rate Changes and Neutralization: A Test of the Monetary Approach Applied to Development and Developing Countries". *Economica*, 46(1979): 281-94.

Cottani, J. A., D. F. Cavallo, and M. S. Khan. "Real Exchange Rate Behaviour and Economic Performance in LDCs". *Economic Development and Cultural Change*, 39(1990): 60-76.

Dean, E. R. *The Supply Response of African Farmers: Theory and Measurement in Malawi*. Amsterdam: 1966.

Diakosavvas, D., and C. Kirkpatrick. 1990. *The Effects of Trade and Exchange Rate Policies on Production Incentives in Agriculture: FAO Economic and Social Development Paper*. Rome: FAO, 1990.

Donovan, D. "Real Responses Associated with Exchange Rate Action in Selected Upper Credit Tranche Stabilization Programs." *IMF Staff Papers*, 28(1981): 698-727.

Edwards, S. *Exchange Rate Misalignment in Developing Countries. World Bank Occasional Paper no. 2*. Baltimore and London: The John Hopkins University Press, 1988.

_____. "Exchange Rate Misalignment in Developing Countries." *Research Observer*, 6(1989): 3-20.

_____., and F. Ng. *Trends in Real Exchange Rate Behavior in Selected Developing Countries*. CPDTA Working Paper. Washington, DC: The World Bank, 1985.

Ghura, D., and T. J. Greenes. "The Impact of Real Exchange rate Misalignment and instability on Macroeconomic Performance in Sub-Saharan Africa." Working Paper. Raleigh, NC.:International Trade Research Consortium, 1991.

Gujarati, D. N. *Basic Econometrics. Second Edition*. New York: McGraw-Hill Book Campany, 1988.

Kirchner, J. W., I. Singh, and L. Squire. "Agricultural Pricing and Marketing Policies in Malawi: A Multi-Market Analysis". CPD Discussion Paper. Washington, DC.: World bank, 1985.

Kravis, I. B., and R. E. Lipsey. *Towards an Explanation of National Price Levels*. Pricenton Studies in International Finance 52. Princeton, N.J.: Princeton University Press, 1983.

Harberger, A. C. "Economic Adjustment and Real Exchange Rate". *In Economic Adjustment in Developing Countries*, eds. S. Edwards, and L. Ahamed. Chicago and London: University of Chicago Press, 1986.

Krueger, A. O., M. Schiff, and A. Valdes. " Agricultural Incentives in Developing Countries: Measuring the Impact of Sector-Specific and Economy-Wide Policies on Agricultural Incentives in LDCs". *World Bank Economic Review*, 2(1988):255-272.

Morgan, T., and A. Davis. "The Concomitant of Exchange Rate Depreciation: Less Developed Countries. *Economic Development a. ! Cultural Change*, 31(1982): 101-30.

Mundlak, Y., D. Cavallo, and R. Domenech. " Effects of Macroeconomic Policies on Sectoral Prices". *The World Bank Economic Review*, 4(1990):55-79.

Officer, L. M. The Law of One Price Cannot be Rejected: Two Tests Based on the Tradable and Non-Tradable Price Ratio. *Journal of Macroeconomics* 8(1986):159-82.

Salter, W. E. G. " Internal and External Balance. The Role of Price and Expenditure Effects. *Economic Record*, 35(1959):226-38.

Sahn, D. E., J. Arulpragasam, and L. Merid. *Policy Reform in Malawi. A Survey of a Decade of Experience, Monograph*. Ithaca, New York: Cornell Food and Nutrition Policy Program, 7 December, 1990.

Silumbu, E. "The Role of the Exchange Rate and Monetary Policy in the Monetary Approach to the

Balance of Payments: Evidence from Malawi." Final Report, Presented at the African Economic Research Consortium (AERC) Workshop, May 24-28, Nairobi, Kenya, 1992.

Standard and Chartered Bank of Zimbabwe. *Africa Quarterly Review*. Harare: December, 1991.

Swan, T. "Economic Control in a Dependent Economy". *Economic Record*, 36(1960):51-66.

Valdes, A. "Impact of Trade and Macroeconomic Policies on Agricultural Growth". *International Food Policy Research Institute*, Reprint 175. Washington DC: 1989.

_____., E. Muchnik, and H. Hurtado. *Trade, Exchange rate, and Agricultural Pricing Policies in Chile. Vol. 1, The Country Study*. World Bank Comparative Study. Washington, DC: The World Bank, 1990.

Williamson, J. *The Open Economy and the World Economy*. New York: Harper International Edition, Basic Books, Inc, 1983.

White, K. J. *Shazam. Econometric Computer Program, User's Reference Manual, Version 7.0*. New York: McGraw-Hill Book Company, 1993.

World Bank. *Trends in Developing Economies*. Washington, DC: 1989, 1990 and 1991.

Chapter 3

The Structure of Exchange Rate Pass-through in the Malawi's Economy

3.1 Introduction

The previous chapter introduced the real exchange rate (RER) as a measure of competitiveness between traded and non-traded goods sectors. From the analysis of Chapter 2, it was concluded that an increase in quantitative trade restrictions, domestic credit, and the terms of trade, appear to lead to an appreciation of the real exchange rate, and also that successive nominal devaluations had a small but significant effect on the effective real exchange rate in the Malawian economy over the same time period. The apparent ineffectiveness of the exchange rate policy to immediately induce a real depreciation in Malawi's currency may partly be attributed to the failure of the economic system to transmit appropriate price signals to consumers and producers. This chapter focuses on the extent to which changes in the exchange rate and foreign import prices are transmitted to domestic import prices. The extent to which exchange rate changes are transformed into import price (denominated in domestic currency) and export price (denominated in foreign currency) changes is referred to as "the pass-through" (Kreinin 1977). According to Kiyono (1988), a high rate of pass-through induces a rapid adjustment in the volume of trade and thus facilitates a rapid restoration of trade balance.

The traditional analysis of the exchange rate and foreign price transmission assumes that the "law of one price" (LOP) or perfect price arbitrage prevails (Jabara and Schwartz 1987). The law of one price stipulates that domestic currency equivalent prices of a good sold in two markets will differ by no more than the transport cost. In effect, a change in the value of domestic currency is said to obey the law of one price by altering the price of exported goods in terms of foreign currencies, thus making exports either more or less expensive to foreign customers and inducing a price and export response that is largely determined by the domestic elasticity of excess supply (Jabara and Schwartz). The law of one price has been tested at different levels of commodity and price aggregations. A detailed discussion on the merits

of respective approaches to testing the hypothesis of "LOP' can be found in the works of Officer (1990), Kravis and Lipsey (1971, 1978), Fromm (1974) and Johnson, Greenes and Thursby (1979), Magee (1979), and Daniel (1986).

3.2 Theoretical Model

Analyses of the exchange rate and price transmission mechanism in various studies (Bolling 1988, Jabara and Schwartz, and Kiyono) begin with the specification of the price linkage equation as a theoretical basis for estimating pass-through elasticities:

$$P = eP^*(1 + t), \tag{3.1}$$

where P and P* are nominal commodity prices expressed in domestic and foreign currencies, respectively, e is the nominal exchange rate in terms of units of domestic currency per unit of foreign currency, and t represents transfer costs. Equation (3.1) can be further expressed in percentage changes, holding transfer costs constant, as:

$$\frac{dP}{P} = \frac{de}{e} + \frac{dP^*}{P^*}. \tag{3.2}$$

The percentage change in the domestic price in equation (3.2) is equal to the percentage change in the exchange rate plus the percentage change in the world price. Equation (3.2) can also be transformed into elasticities of pass-through with respect to the exchange rate and the foreign price as:

$$\varepsilon_{P_e} = \frac{\Delta P/P}{\Delta e/e}. \tag{3.3}$$

$$\varepsilon_{P_{P^*}} = \frac{\Delta P/P}{\Delta P^*/P^*}. \tag{3.4}$$

Under competitive market conditions, and assuming that the "law of one price" holds, it is expected that the elasticities of exchange rate and foreign price transmission will not be significantly different from one. Deviations from unitary elasticity of exchange rate and foreign price transmission have

been attributed to price and non-price distortions which include tariffs and quantitative restrictions (Officer 1990). Governments often impose price or non-price trade restrictions, for example, quotas, either to generate revenue or to protect domestic industries from foreign competition. Both of these instruments restrict the quantity of imports and exports, and therefore offset the effect of a devaluation or a revaluation on the domestic prices. Figure 3.1 illustrates the effect of tariffs or quantitative restrictions (quotas) on the elasticity of pass-through.

Figure 3.1. The Effect of Tariffs and Quantitative Restrictions on Pass-through

Source: Adapted from Ulbrich, H. *International Trade and Finance: Theory and Policy*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc, 1990.

Panel (a) of Figure 3.1 represents the world supply of exports, whereas panel (b) represents the supply of and demand for domestic imports. The vertical and horizontal axes represent prices and quantities of imports respectively. The price levels P^*_0 and P^*_1 are associated with exchange rate levels e_0 and e_1, respectively. Assuming that the foreign currency is devalued from e_0 to e_1, the domestic price of imports is expected to decline from P_0 to P_1. In a perfectly competitive environment, the law of one price ensures that the elasticity of price transmission, $\varepsilon_{P_e} = \dfrac{(P_0 - P_1)/P_0}{(e_0 - e_1)/e_0}$ is equal to one. This implies that a change in the exchange rate or foreign price of a commodity is fully transmitted to the domestic prices. However, if a tariff is imposed, the domestic price of imports rises to P^T_M. It is evident from panel (b) that elasticity of pass-through with a tariff imposed, $\varepsilon_{T_e} = \dfrac{(P_m - P_m^T)/P_m}{(e_0 - e_1)/e_1}$ is less than the elasticity in a free market condition.

Using the preceding scenario, it can be demonstrated that a quantitative restriction on imports such as a quota, would have a similar effect on the elasticity of pass-through as a tariff. A decline in the world price of traded goods from P^*_0 to P^*_1, would encourage domestic producers to decrease their production to M_1, whereas consumers would demand M_2. The excess demand created by domestic demand and supply, M_2-M_1, would constitute total imports under free trade. A restriction on the volume of imports through a quota of say M_4, would cause an increase in the domestic price of imports to P^T_m, and would thereby encourage domestic producers to increase their output to M_3. Like in the case of a tariff, the decline in the world price of tradable goods would be offset by the rise in the domestic price of imports.

Several economists including Kreinin and Kiyono observe that the pass-through effect is also influenced by the elasticities of export supply and import demand, and the market share. The effect of supply and demand elasticities on pass-through can be verified by changing the slopes of the demand and supply curves in panel (b) of Figure 3.1. However, Kiyono uses the following expression to demonstrate the effect of both the supply and demand elasticities and market share on the elasticity of pass-through,

$$\varepsilon_{P_e} = \frac{\theta_x \varepsilon_x}{\varepsilon^*_m + \theta^*_x \varepsilon^*_x + \theta_x \varepsilon_x} = \frac{(1/\varepsilon_m)}{(1/\varepsilon_m) + (1/\varepsilon_x)} \qquad (3.5)$$

where θ_x (θ^*_x) represents the market share for the domestic economy (or other net exporting countries), ε^*_m represents the price elasticity of the total import demand of the net-importing countries, and ε_x (ε^*_x) is the price elasticity of the domestic economy (or other net exporting countries), and ε_m is the price elasticity of the net import demand of the rest of the world i.e.,

$$\varepsilon_m = (\varepsilon^*_m + \theta^*_x \varepsilon^*_x)/\theta_x . \qquad (3.6)$$

From equation (3.5), it can be deduced that the elasticity of pass-through will always lie between zero and unity. The pass-through rate is expected to rise as the domestic market share, θ_x, and elasticity of exports, ε_x, rise. The pass-through rate is also expected to rise as the price elasticity of total import demand for the net importing countries, ε^*_m, and the price elasticity of exports of other foreign net-exporting countries, ε^*_x decline.

Augmenting the preceding theoretical construct, Kreinin suggests that a small country which can be assumed to face an infinitely elastic supply of exports from its trading partners, is likely to experience a nearly complete pass-through on the import side. However, Kreinin argues that only a partial pass-through can be expected with respect to import prices of a large country, which presumably faces an upward-sloping export supply curve. In this context, the extent of pass-through can be related to a country's ability to influence the terms of trade.

Although Kiyono's and Kreinin's studies imply that exporters in a large country are more likely to pass-through a greater proportion of a devaluation or revaluation than exporters in a small open economy, some economists have suggested that the price response in an imperfectly competitive market, may be asymmetric (Jabara and Schwartz). The asymmetry in the price response is also referred to as the "ratchet effect hypothesis". Essentially, the "ratchet effect hypothesis" presumes that downward price rigidities in trading countries dictate that all, or most, of the price adjustment to an exchange rate change take place in the devaluing country via price increases, with little adjustment occurring in the revaluing country. (Jabara and Schwartz).

It is apparent from the preceding discussion that for small countries such as Malawi, analysis of

pass-through on the import side is more relevant than on the export side. However, this does not preclude analyzing the pass-through structure for those commodities in which a small country has a significant market share. Based on the theoretical framework presented earlier, it can be hypothesized that the elasticity of pass-through with respect to Malawi's imports is not significantly different from one.

3.3 Literature Review

Elasticities of price and exchange rate pass-through have been estimated in various studies. Some of the most recent elasticity estimates can be found in the works of Tweeten 1967), Johnson (1977), Bredahl, Meyers, and Collins (1979), Bolling (1980 and 1988), Pompelli and Pick (1990). The hypothesis of perfect exchange rate pass-through with respect to the import price does not appear to be supported in a number of studies including that of Isard (1977), Richardson (1978), Dunn (1978), Jabara and Schwartz, and Pompelli and Pick. Results obtained in Pompelli and Pick's study on the pass-through of exchange rates and tariffs between Brazil and the U.S., show that only 14.5 per cent of the Brazilian exchange rate changes are passed on to the U.S import prices. Pompelli and Pick argue the low pass-through rate with respect to Brazilian exchange rate is indicative of Brazil's desire to maintain or even increase their share of the U.S market.

In a related study on the exchange rate pass-through, Woo (1984) found that import prices fail to fall by the full amount of a depreciation in the foreign currency. The findings by Woo suggest the presence of discriminatory behavior as a major contributory factor to the low pass-through rates. Dunn, Dornbusch (1987), and Giovannini (1988) have also documented the effect of market structure on the rate of pass-through. Dunn's work on the effect of exchange rates on import prices in the Canadian market indicates that firms that wish to maintain stable prices in foreign markets exhibit market power with a system of variable price discrimination.

A study by Bolling in 1988, on price and exchange rate transmission for Latin American countries, demonstrates that there is a wide range of nominal farm price responses to any change in the world price. The degree of domestic farm price responsiveness to exchange rate and foreign price changes in Bolling's

study, appear to be influenced by the magnitude of policy induced distortions on exchange rates and prices. However, results obtained in the study do not support the hypothesis of perfect price transmission.

In contrast to the overwhelming evidence of incomplete pass-through documented in several studies, Leith (1991) demonstrates a perfect price transmission between Botswana and South Africa. According to Leith, the exchange rate pass-through adjustment for a small open economy such as Botswana is not instantaneous, but that lasts 15 months. However, Leith's analysis of pass-through uses the bilateral exchange rate between Botswana and South Africa as a measure of competitiveness and the latter's consumer price index as a proxy for the world price. It has been argued by (Edwards 1989) and several others that a bilateral exchange rate may misrepresent the influence of a country's other important trading partners on its competitiveness. The use of CPI as a proxy of the world price may also not fully reflect the linkage between Botswana's import price and its trading partners' export prices. The use of alternative measures of competitiveness and price indices that reflect multiple trading partners' behavior, may yield results that are different from Lieth's. In support of Leith's findings, Mundlak and Larson (1992) however, found that variations in world prices were fully transmitted to domestic prices of several developing countries.

It is apparent from the preceding discussion that the pass-through rate is influenced by several factors which include market structure, price and non-price distortions and elasticities of supply and demand, as well as lags in the domestic price adjustment to changes in the exchange rate. In addition, price stickiness, or the ratchet effect, has been identified as having a negative effect on price adjustment to exchange rate changes.

Although the factors discussed in the preceding section may appear to play a major role in determining the extent of exchange rate and foreign price transmission, the behavior of Malawi's domestic import price appears to have also been influenced by the disturbance and closure of the traditional trade routes through Mozambique in the early 1970s, and throughout the 1980s. As discussed in Chapter 1 of this study, the alternative trade routes resulted in a rise in the cost of haulage. Another factor that is likely to have influenced the behavior of Malawi's import price is the trade liberalization policy instituted in 1985

as part of the IMF conditionalities for structural adjustment loans. Trade liberalization involves removal of price and non-price distortions and is therefore expected to have a downward effect on the import price. Thus, in addition to testing the hypothesis of perfect exchange rate and foreign price pass-through, the study analyzes the effect of closure of the Mozambique trade route and implementation of the trade liberalization policy on Malawi's import price.

3.4 Model Specification

The price transmission equation (3.1) has been used by Bolling to estimate pass-through elasticities for several Latin American countries as:

$$\ln P_t = \beta_0 + \beta_1 \ln e_t + \beta_2 \ln P_t^* + \mu_t , \tag{3.7}$$

where μ is assumed to be a random error term. Assuming that free market conditions prevail, perfect price transmission would entail that β_1 and β_2 be equal to one. Values of β_1 and β_2 being less than one would indicate less than perfect price transmission. Imperfect transmission of price signals may occur as a result of market imperfections or government control in the market place. Domestic prices may also adjust with a lag to foreign price and exchange rate changes because of inventory accumulation and sales contracts executed before such changes take place.

Autoregressive models provide a basis for incorporating dynamic adjustment in empirical studies. Assuming that Malawi's import prices do not immediately adjust to their long term equilibria due to inertia, contractual obligations and economic rigidities, the structure of price and exchange rate pass-through can be modelled through a partial-adjustment framework as discussed in Gujarati (1988). In light of these observations, equation (3.7) is modified to incorporate the effects of a lag in the adjustment resulting from rigidities in the economic system and the disturbances and eventual closure of the major trade route through Mozambique, the IMF-led partial market liberalization policy[1] in 1985:

---

[1]Partial market liberalization is used to describe a partial price dereguration and a subsidy removal program launched in 1985.

$$\ln P_t = \gamma\beta_0 + \gamma\beta_1 \ln e_t + \gamma\beta_2 \ln P_t^* + \gamma\beta_3 DEV + \gamma\beta_4 PORT + \gamma\beta_5 LIB + (1 - \gamma) \ln P_{t-1} + \mu_t \quad (3.8)$$

where "PORT" is a dummy variable, taking the value of one from 1978 (the period in which the Mozambique ports were constantly under military siege and eventually closed) otherwise zero; LIB is a partial market liberalization dummy variable taking one from 1985, otherwise zero. The parameter γ represents the change in the actual price level as a proportion of the desired or equilibrium price, such that $0 < \gamma < 1$.

Two competing models, static and dynamic, are implied in equation (3.8). The hypothesis associated with the dynamic version is that changes in the exchange rate and foreign prices are transmitted with a lag. If $\gamma = 1$, equation (3.8) reduces to a static version and thus the import price is expected to adjust instantaneously to its equilibrium level.

3.5 Data

Annual data for a period of 24 years, 1965 to 1988, were used in the study. Sources of data included publications of the Malawi Government, the Reserve Bank of Malawi, the IMF and the World Bank. The unit import price index for Malawi and the rest of the world were used to represent the domestic price and foreign prices for imports, respectively. The world unit price for imports was obtained from the IMF Statistical Yearbook, and the domestic unit price for imports was obtained from the *Financial and Economic Review* of the Reserve Bank of Malawi. A multilateral exchange rate (the effective real exchange rate), based on a weighted index of the exchange rates of Malawi's major trading partners[2] was used in the estimation of the exchange rate and foreign price pass-through elasticities. All the variables used in the study were deflated by appropriate indices.

---

[2]USA, Britain, Germany, South Africa, Zambia, and Zimbabwe.

3.6 Empirical Estimation and Results

Both static and dynamic version of equation (3.8) were estimated using maximum likelihood procedures. Results of the estimated parameters are presented in Table 3.1.

Table 3.1. Estimates of Exchange Rate and Price Transmission Elasticities

	Static Model		Dynamic Model (Short Run)		Dynamic Model (Long Run[3])	
Variable	**Estimate**	**S.E**	**Estimate**	**S.E**	**Estimate**	**S.E**
Constant	-0.528,	0.109	-0.302*	0.089	-0.529*	0.212
EER	1.200*	0.178	0.797*	0.132	1.396*	0.365
P_m^*	0.140*	0.056	0.100*	0.043	0.175**	0.092
LIB	-0.151*	0.068	-0.084*	0.032	-0.147*	0.095
PORT	0.256*	0.041	0.138*	0.049	0.242*	0.070
LP_m	-		0.429*	0.087	-	-
DEV	0.011*	0.004	0.005*	0.002	0.008	0.005
γ	-		-		0.571*	0.119
DW	1.970		1.150[H]			
Adj-R^2	0.950		0.956			
LLF	33.581		39.077			

EER = Effective exchange rate;
P_m^* = Price of imports, designated in foreign currency;
LIB = Dummy variable for trade liberalization policy;
PORT = Dummy variable for disturbance and closure of major trade route;
LP_m = Lagged domestic price of imports;
DEV = Percent devaluation of the Malawi Kwacha;
H = Durbin-H statistic;
γ = Adjustment Coefficient;
LLF = Value of the log likelihood function;
S.E = Standard error;
* Significant at the 95 per cent confidence level; and ** Significant at the 90 per cent confidence level.

[3]Estimates of long run coefficients were derived from estimates of the short run model as discussed in Chapter 2.

Generally, the estimated parameters in both the static and dynamic models have the expected theoretical signs. The estimated coefficient for the lagged dependent variable is significantly different from zero, implying that the actual change in the domestic price of imports between one year and the next does not fully reflect the change in the equilibrium price of imports. Based on the estimated likelihood functions, the dynamic models appear to fit the data better than the static model. Thus the discussion which follows is based on the short and long-run parameter estimates of the dynamic model.

The estimated elasticities with respect to the real exchange rate in both the short and long-run regression equations are not significantly different from one at 95 per cent confidence level. Thus, the hypothesis that a change in the real exchange rate is perfectly transmitted to the domestic price of imports can not be rejected for both the long-run and the short-run. In contrast, the pass-through elasticity estimates with respect to the foreign price of imports are significantly different from one at the same confidence level. In the light of these findings, the hypothesis of perfect transmission with respect to foreign denominated import prices is not supported.

Currency devaluation and the closure of the Mozambique port appear to have an inflationary effect on the real price of imports. The closure of the trade route is associated with an increase in the price of imports by 14 per cent and 24 per cent in the short-run and long-run respectively, whereas a one per cent devaluation of the Malawi Kwacha is associated with 0.005 per cent and 0.008 per cent rise in the price of imports over the same time period. Results in Table 3.1 also indicate that a partial market liberalization is associated with a relative decline in the price of imports by 0.08 per cent and 0.15 per cent in the short-run and long-run, respectively.

With the exception of the foreign price pass-through, the results confirm the observations made by Kreinin that a small country which can be assumed to face an infinitely elastic supply of exports from its trading partners, is likely to experience a nearly complete pass-through on the import side. In a number of related studies (Isard, Richardson, Dunn, Jabara and Schwartz), the hypothesis of complete pass-through or the law of one price has been rejected. According to Goodwin (1990) however, rejections of the law of one price in most standard approaches are more common with disaggregated commodities than

aggregated commodities. Goodwin's observations are also confirmed by Jabara and Schwartz who observe that disaggregated agricultural commodity prices commonly violate the LOP. In a study involving a dichotomous model of tradable and non-tradables, Officer obtained results that offer additional support for the law of one price at an aggregate level.

A high rate of exchange rate pass-through with respect to African countries has also been reported by Leith and Mundlak. However in Leith's study the price adjustment is spread over a period of 15 months. Similarly the adjustment in this study appears to last longer than one year. As observed by Khadr, Parks, and Walton (1989), a rapid adjustment of the domestic price following a change in the exchange rate in Malawi is expected, considering that the country is highly dependent on non-competing imports. Holding foreign denominated import price constant, currency devaluation translates into an increase in the quantity of domestic currency necessary to purchase one unit of imported goods. Importers are forced to completely pass the increase in the cost of imports to consumers in order to break even. The increase in the domestic price of imports would have been more minor if the domestic demand for imported goods could have been met through substitution of locally produced goods.

The limited nature of foreign price transmission is probably due to imperfect competition, contractual obligations and government price controls on certain commodities. A study by the World Bank (1988) characterizes Malawi's industrial structure as being highly oligopolistic. Findings from the Bank's survey indicates that firms that sell in what may be categorized as highly competitive markets account for 11 per cent of the total domestic markets, whereas firms that sell in an oligopolistic market account for 86 per cent of the domestic market. Although this high level of industrial concentration may be considered desirable to achieve economies of scale in a country with a small domestic market such as Malawi, its effect on price transmission may be economically harmful. Foreign price reductions, for example, are more likely to accrue to importers, as economic rent, than to consumers. However, consumers may be more likely to suffer the full impact of foreign price increases than importers. Distortions of price signals are likely to generate sub-optimal decisions and resource misallocation. In terms of international trade, price distortions, through their effects on aggregate supply and demand, contribute to deficits in the balance

of payments. A comprehensive discussion on the effects of imperfect competition and these other factors on pass-through can be found in Officer's literature survey.

3.7 Conclusion

The major objective was to determine the extent to which changes in the effective exchange rate and the foreign currency denominated import price are transmitted to aggregate domestic import price in Sub-Saharan Africa using Malawi as a case study. In addition, the effects of a partial market liberalization and the disturbance and closure of Malawi's major trade route on the import price were analyzed. The estimated coefficients strongly support the hypothesis that changes in the real exchange rate are fully transmitted to the real domestic price of imports in both the short-run and long-run. However, the results appear to reject the hypothesis that changes in the real foreign denominated import prices are fully transmitted to domestic import prices over the same periods.

The partial market liberalization policy implemented as part of the IMF structural adjustment programme appears to have had a significant downward effect on the real price of Malawi's imports. A partial price deregulation and the subsidy removal program that were instituted in 1985 are likely to have created a favorable environment for competition and increased efficiency in resource allocation. The downward pressure on the aggregate import price is likely to have been generated by increased availability of goods and services.

The disturbances and closure of the Mozambique trade route appear to have had a significant inflationary effect on the real price of imports. The increase in the price of imports associated with the closure of the trade route is estimated at 14 per cent in the short run and 24 per cent in the long run. The role of currency devaluation is to improve the trade balance through the differential effect on the volume of imports and exports. If the change in the real exchange rate is fully transmitted to domestic import prices as indicated by the results in this study, then the apparent failure of the exchange rate policies to improve trade balance in the Sub-Saharan Africa should be attributed to other factors than inflexibility in the price of imports. Trade balance can only improve if policy targets the factors that inhibit rapid

adjustment to relative price changes.

3.8 Bibliography

Bolling, C. "Price and Exchange Rate Transmission Revisited: The Latin American Case, *in Elasticities in International Agricultural Trade*, eds. Cater, C. A., and W. H. Gardiner. Boulder and London: Westview Press, 1988.

Daniel, B. C. "Empirical Determinants of Purchasing Power Parity Deviations". *J. Int. Econ*, 21(1986):313-26.

Dornbusch, R. "Exchange Rates and Prices". *Amer. Econ. Rev*, 77(1987):93-106.

Dunn, R. M., Jr. "Flexible Exchange Rates and Oligopoly Pricing: A Study of Canadian Markets". *J. Plot. Econ*, 78(1978):140-51.

Fromm, G. "Comment ", *in The Effects of Exchange Rate Adjustments*, eds. Clark, P. B., D. E. Logue, and R. J. Sweeney. Washington, D.C: Department of Treasury, 1974.

Giovannini, A. "Exchange Rates and Traded Goods Prices", *J. Int. Econ*, 24(1988):45-68.

Gujarati, D. N. *Basic Econometrics, 2nd Edition*. New York:McGraw-Hill, 1988.

Goodwin, B. K. "Empirically Testing the Law of One Price in International Commodity Markets: A Rational Expectations Approach", *in International Financial Markets and Agricultural Trade*, ed. Greenes. T. Boulder, San Francisco, & London: Westview Press, 1990.

Isard, P. "How Far Can We Push the "Law of One Price ?". *Amer. Econ. Rev*, 67(1977):942-48.

Jabara, C. L., and N. E. Schwartz. "Exchange Rates and Commodity Prices", *Amer. J. Agr. Econ*, 69(1987):580-90.

Johnson, P. R., T. Greenes, and M. Thursby. "Trade Models with Differentiated Products". *Amer. J.Agr. Econ*, 61(1979):120-27.

Judge, G., R. Hill, H. W. Griffiths, H. Lutkepohl, and T. Lee. *Introduction to the theory and Practice of Econometrics, Second edition*. New York: John Wiley and Sons, 1988.

Khadr, A., J. Parks, and M. Walton. "Inflation in Malawi". Unpublished Report, 1989.

Kiyono, K. "Yen Appreciation and Japan's Pass-Through Structure". Paper presented at the Conference

of the Japan Social Sciences Association of Canada, Held at McGill University, Montreal from October 7-8, 1988.

Kravis, I. B., and R. E. Lipsey. *Price Competitiveness in World Trade*. New York: Columbia University Press, 1971.

_____ . "Price Behavior in the Light of Balance of Payments Theories". *J. Int. Econ*, 8(1978):193-246.

Kreinin, M. E. "The Effect of Exchange Rate Changes on the Prices and Volume of Foreign Trade". *IMF Staff Papers*, 24(1977):297-329.

Leith, J. C. "The Exchange Rate and Price Level in Small Open Economy: Botswana". *J. Pol. Model*, 13(1991):309-315.

Magee, S. P. "Contracting and Spurious Deviations from Purchasing Power Parity", in *The Economics of Exchange Rates*, eds. Frenkel, J. A., and H. G. Johnson. Reading, MA: Addison-Wesley, 1978.

Mundlak, Y., and D. F. Larson. "On the Transmission of World Agricultural Prices". *The World Bank Economic Review*, 6(1992):399-422.

Officer, L. H. "The Law of One Price: Two Levels of Aggregation", *in International Financial Markets and Agricultural Trade*, ed. Greenes. T. Boulder, San Francisco, & London: Westview Press, Boulder and London: Westview Press, 1990.

Pompelli, G. K., and D. H. Pick. "Pass-Through of Exchange Rates and Tariff in Brazil-U. S. Tobacco Trade". *Amer. J. Agr. Econ*, 72(1990):676-681.

Richardson, D. J. "Some Empirical Evidence on Commodity Arbitrage and the Law of One Price". *J. Int. Econ*, 8(1978):341-51.

White, K. J. *Shazam, Econometrics Computer Program, User's Reference Manual, Version 7.0*. New York: McGraw-Hill Book Company, 1993.

World Bank. *Relative Incentives and Efficiency of the Industrial Sector in Malawi*. Washington, DC: The World Bank, 1988.

Chapter 4.

The Effect of Currency Devaluation on Trade Balance

4.1 Introduction

The desired effect of a currency devaluation, which has been an integral part of the IMF-sponsored structural adjustment program (SAP) in Malawi and other African countries, is an improvement in the trade balance. However, after successive devaluations of the Malawi Kwacha in the 1980s the decline in trade balance, as illustrated in Figure 4.1, does not appear to support the hypothesized exchange rate effects. The downward trend in trade balance raises doubt on the universality of the exchange rate policy as an effective tool for mitigating the balance payments problems in developing countries.

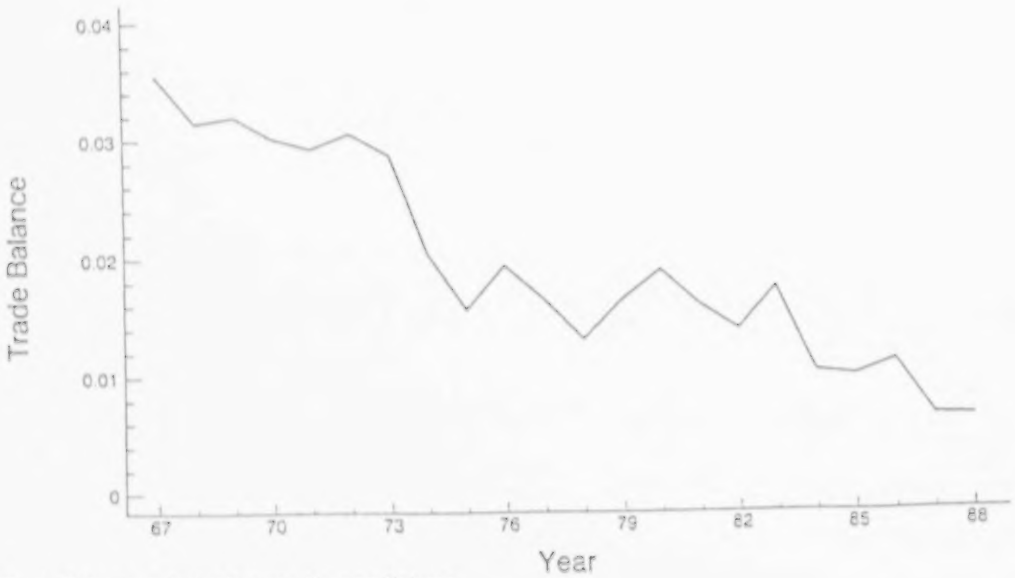

Figure 4.1 The Behavior of Malawi's Trade Balance Between 1965 and 1989

The theoretical and practical importance of analyzing the effects of a devaluation on trade balance is to provide a means for testing economic theories, explaining the structure of commodity markets, forecasting trade flows and analyzing the effects of government policies (Gardiner and Carter 1988). Estimation of trade elasticities provides invaluable information for designing and evaluating policy options. The primary objective of this chapter is to analyze the effect of currency devaluation on Malawi's trade balance.

The theoretical basis for trade balance to positively respond to currency devaluation hinges on satisfying the Marshall-Lerner condition. As discussed in chapter one, the Marshall-Lerner condition requires that the sum of the elasticities of the country's demand for imports and demand by the rest of the world for its exports, be greater than one in absolute value. Satisfaction of this condition implies that price signals are fully transmitted to economic agents. However, even if price signals are fully transmitted, responsiveness of trade balance to relative price changes may be delayed due to rigidities, contractual obligations, or lags in production cycles. The lagged adjustment to relative price changes is also referred to as the J-Curve phenomenon following the pattern assumed by the trade flows in the post-devaluation period. The second objective of this chapter is therefore to assess whether the adjustment in Malawi's trade follows a J-Curve phenomenon as hypothesized in international trade literature.

4.2 Theoretical Model

The elasticities approach to balance of payments analysis assumes that only exchange rate changes are relevant in the analysis of exports and imports, and that all other variables remain constant. This assumption suggests that the positions of the demand curves for exports and imports are held constant.

The elasticities approach is also based on the assumption that all relevant output supply elasticities are infinite such that the price of exports in domestic currency does not rise as demand increases, the price of imports in foreign currency does not fall as demand for imports falls, and the price of domestic goods competing with imports does not rise as the demand for import substitutes increases. It is also assumed that trade is initially balanced and that the change in the exchange rate is small.

It is apparent from the preceding discussion that analyses of currency devaluation on trade balance should begin with the specification of domestic demand for imports and foreign demand for domestic exports or excess supply. Domestic demand for imports is derived from utility maximization. Utility theory postulates that a consumer chooses a bundle of goods G(m) that maximizes satisfaction U(m) subject to a budget constraint (Y) (Varian 1984); i.e.,

$$\begin{aligned} B &= \{g \sim G: (p.g) \leq y\} \\ &\max u(g) \\ &s.t.\ (p.g) \leq y \\ &\quad g \sim G \end{aligned} \tag{4.1}$$

where: g and p are vectors of goods and prices, and y is a fixed quantity of income. Although utility theory is based on the behavior of an individual consumer, it can be used to define aggregate demand if we assume that all consumers have similar indifference curves. With this assumption, the aggregate demand of domestic imports can be presented as:

$$M_t = M_t\left(\frac{eP_M^*}{P_N}, Y_t\right), \tag{4.2}$$

where M_t is the quantity of imports, P_M^* and PN are weighted average of foreign import and export prices and domestic price for non-tradable goods, respectively, Y_t is the real domestic income, and e is the nominal exchange rate in terms of units of domestic currency per unit of foreign currency.

The supply of domestic exports is derived from the theory of profit maximization (Chambers 1991):

$$\begin{aligned} \Pi(p,r) &= \max_{x \geq 0}\{p\ f(w) - (r.w)\} \\ &= \max_{x \geq 0}\{px - c(r,x)\} \end{aligned} \tag{4.3}$$

where x is the quantity of output, r and p are input and output price vectors, respectively, and w is a vector of input levels. From duality theory output supply is defined as a function of input and output prices. Hence the domestic export supply function is defined as:

$$X_t = X_t\left(\frac{P_X}{P_N},\ Y_t^*\right), \tag{4.4}$$

where X_t is the volume of exports, and P_x is the unit price of exports. The foreign real income variable, Y_t^*, is included to account for shifts in the supply function resulting from external influences. The difference between equation (4.4) and (4.2) constitutes trade balance; i.e,

$$TB_t = X_t\left(\frac{P_X}{P_N},\ Y_t^*\right) - M_t\left(\frac{eP_M^*}{P_N},\ Y_t\right), \tag{4.5}$$

where TB_t represents trade balance. Equation (4.5) reduces to:

$$TB_t = TB_t\left(\frac{P_T}{P_N},\ Y_t^*,\ Y_t\right). \tag{4.6}$$

where $\partial TB_t / \partial(P_T / P_N) > 0$, $\partial TB_t / \partial Y_t^* > 0$, and $\partial TB_t / \partial Y_t < 0$.

Assuming the Marshall-Lerner condition is satisfied, an increase in the relative price is expected to have a positive impact on trade balance. Trade balance is also expected to increase as foreign income increases, and to decline as the real domestic income increases.

The immediate effect of a currency devaluation is to increase the relative price between imported and domestic goods. The quantity of imports demanded is expected to fall as the quantity of domestic currency required to purchase the same unit of foreign currency rises. However, the volume of exports is expected to rise as domestic producers expect to receive a larger quantity of domestic currency for the same unit of foreign currency.

Although the hypothesized relationship between trade flows and relative prices is plausible, the adjustment in the export and import volumes may involve a time lag. The lagged adjustment in trade flows to a devaluation has been referred to as the J-Curve effect in international trade literature. As illustrated in Figure 4.2, the trade balance deteriorates immediately following a devaluation and subsequently improves.

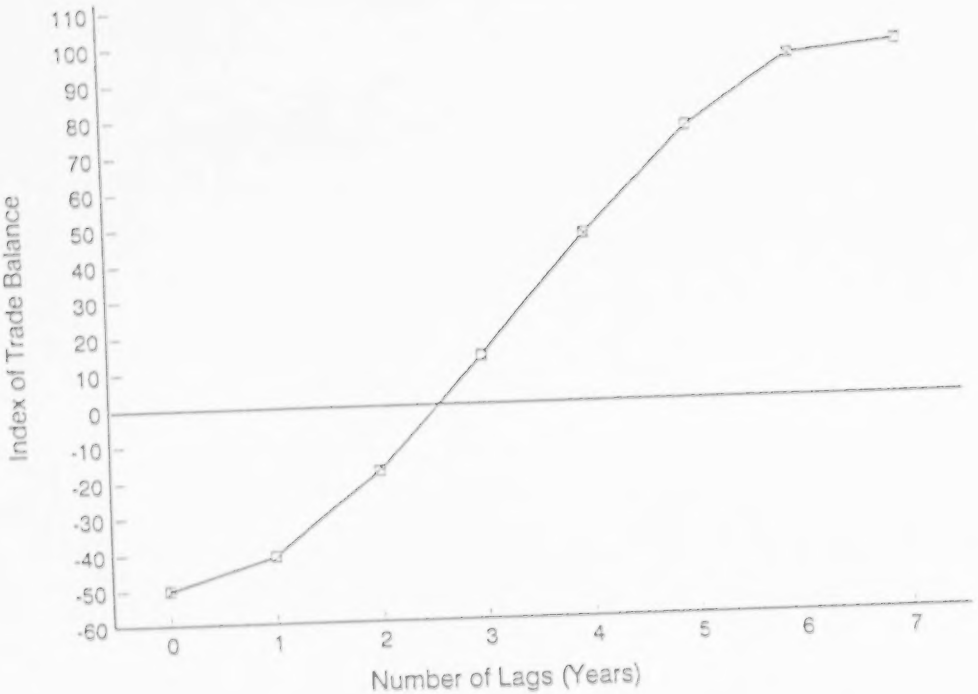

Figure 4.2 A Hypothetical J-Curve Effect

The deterioration in trade balance arises partly from increased expenditure on import transactions contracted before the devaluation and a lagged response on the production side. Carbaugh (1980) observes that a lag in adjustment may be caused by failure to recognize a change in competitive conditions, uncertainty in forming new business connections and placing new orders, or a lag in delivery between the time new orders are placed and the time relative price changes have an impact on trade and payments flows. Other factors considered by Carbaugh as contributing to the J-Curve effect include replacement and production lags.

4.3 Literature Review

Empirical evidence on the effect of currency devaluation on trade balance appears inconclusive. Results obtained in one of the earliest studies (Laffer 1973), involving fifteen post war devaluations, do not support the hypothesis that devaluation would lead to an improvement in the trade balance. Currency devaluation appeared to lead to an improvement in trade balance only in eight of the fifteen countries in Laffer's study, in the year following the devaluation. However, this improvement did not seem to last longer than two to three years. A study by Salant (1975) also indicates that the effect of currency devaluation on trade balance in both developing and developed countries is debatable. Miles (1974) observes that the results obtained in some of the earlier studies may have been influenced by the failure to incorporate the effects of time and domestic policy on trade flows, and the use of annual data. However, Miles's study, which uses quarterly data and residuals as indicators for trade flows, does not appear to support the hypothesis that devaluation improves trade balance even after allowing for a time lag as predicted by the J-Curve effect. Although the J-Curve phenomenon is theoretically plausible, its existence has not been demonstrated in several African countries including Malawi. In a simulation study by Benjamin (1990), involving Cameroon, Bolivia and Indonesia, devaluation of currency appears to have an initial negative effect on trade balance only in countries whose investment is concentrated in the service sector prior to the devaluation.

The role of domestic policy variables in explaining the departure of the trade-flows from the behavior stipulated by the elasticities model has also been documented by Harberger (1950) and Stern (1973). According to the two authors, the income effects of a devaluation alter the Marshall-Lerner condition upon which the elasticities approach to balance of payments analysis is based. Harberger and Stern argues that the traditional elasticities model holds real autonomous expenditure constant allowing autonomous expenditure in money terms to vary in response to a devaluation, so that in a two country model, money expenditure rises in the devaluing country and falls in the non-devaluing country. The resulting effect is said to be a rise in imports in the devaluing country and a reduction in the exports of the devaluing country to the non-devaluing country. Providing that these conditions prevail, Stern argues that

a depreciation would only improve the trade balance and balance of payments if

$$\epsilon_x + \epsilon_m > 1 + m_1 + m_2 \qquad (4.7)$$

where ϵ_x and ϵ_m are export supply and demand elasticities, and m_1 and m_2 represent the marginal propensity to import in the devaluing and non-devaluing countries, respectively. Equation (4.7) holds real expenditure constant but allows money expenditures to vary. In support of the contention expressed by Harberger and Stern, Stienherr (1981) observes that exchange rate policy unambiguously yields conventional results only where the price mechanism results in rapid market clearing at unchanged unemployment, with government expenditure fixed in real terms.

4.4 Model Selection

The basic model, in the preceding section, is:

$$TB_t = \alpha_0 + \alpha_1 RER_t + b_1 Y_t^* + b_2 Y_t + \varepsilon_t. \qquad (4.8)$$

where TB_t is the trade balance, RER_t is the real exchange rate, measured as a ratio of the price of traded and non traded goods (P_T/P_N), and Y and Y^* represent real domestic and foreign incomes, respectively. The effect of successive devaluations in Malawi may be underestimated if the partial market liberalization policy, part of the IMF-sponsored structural adjustment programme, and closure of the Mozambique trade route are not recognized in the analysis. The model is, therefore, modified as:

$$TB_t = \alpha_0 + \alpha_1 RER_t + b_1 Y_t + b_2 Y_t^* + b_3 LIB + b_4 PORT + \varepsilon_t. \qquad (4.9)$$

where "PORT" is a dummy variable that takes the value of one from 1978 (the period in which the Mozambique ports were constantly under military siege and eventually closed) and is otherwise zero; LIB is a liberalization dummy variable that takes the value one from 1985 and is otherwise zero.

Based on the hypothesis that the adjustment process in Malawi's trade balance follows a J-Curve, an Almon distributed-lag model is applied.

4.4.1 Almon Distributed-Lag (ADL) Model

Consider an finite distributed-lag model of the following form:

$$TB_t = b_0 + b_1 Y_t + b_2 Y_t^* + b_3 LIB + b_4 PORT + \beta_0 RER_t + \beta_1 RER_{t-1} + \beta_2 RER_{t-2} + ... + \beta_k RER_{t-k} + \varepsilon_t , \quad (4.10)$$

which may be expressed more compactly as:

$$TB_t = b_0 + b_1 Y_t + b_2 Y_t^* + b_3 LIB + b_4 PORT + \sum_{i=0}^{k} \beta_i RER_{t-i} + \varepsilon_t . \quad (4.11)$$

From Weiestrass's theorem, Almon assumes that β_i can be approximated by a suitable-degree polynomial in i, the length of the lag (Gujarati 1988); i.e.,

$$\beta_i = \alpha_0 + \alpha_1 i + \alpha_2 i^2 + ... + a_m i^m , \quad (4.12)$$

where m is the degree of the polynomial. Substituting equation (4.12) into (4.11) gives:

$$TB_t = b_0 + b_1 Y_t + b_2 Y_t^* + b_3 LIB + b_4 PORT + \sum_{i=0}^{k} (\alpha_0 + \alpha_1 i + \alpha_2 i^2 + ... + \alpha_i^m) RER_{t-i} + \varepsilon_t , \quad (4.13)$$

which is the same as:

$$TB_t = b_0 + b_1 Y_t + b_2 Y_t^* + b_3 LIB + b_4 PORT + \alpha_0 \sum_{i=0}^{k} RER_{t-1} + \alpha_1 \sum_{i=0}^{k} i\ RER_{t-i} + \alpha_2 \sum_{i=0}^{k} i^2\ RER_{t-i} + ... \alpha_m \sum_{i=0}^{k} i^m\ RER_{t-i} + \varepsilon_t . \quad (4.14)$$

Defining

$$\begin{aligned} Z_{0t} &= \sum_{i=0}^{k} RER_t \\ Z_{1t} &= \sum_{i=0}^{k} i\ RER_{t-i} \\ Z_{2t} &= \sum_{i=0}^{k} i^2\ RER_{t-i} \\ &..... \\ Z_{mt} &= \sum_{i=0}^{k} i^m\ RER_{t-i} \end{aligned} \quad (4.15)$$

equation (4.14) may be rewritten as:

$$TB_t = b_0 + b_1 Y_t + b_2 Y_t^* + b_3 LIB + b_4 PORT + \alpha_0 Z_{0t} + \alpha_1 Z_{1t} + \alpha_2 Z_{2t} + \alpha_3 Z_{3t} + \ldots\ldots + \alpha_m Z_{mt} + \varepsilon_t . \quad (4.16)$$

The Almon scheme specified in equation (4.14) can be estimated by regressing the dependent variable TB on the constructed Z variables. As long as the disturbance term ϵ_t satisfies the assumptions of the classical linear regression model, equation (4.16) can be estimated using the ordinary least squares (OLS) procedure (Gujarati 1988). Assuming the estimated model was a second degree polynomial with three lags, the original RER_t estimates (β's) could be derived from the estimates of the Z variables as follows:

$$\begin{aligned} \hat{\beta}_0 &= \hat{\alpha}_0 \\ \hat{\beta}_1 &= \hat{\alpha}_0 \hat{\alpha}_1 + \hat{\alpha}_2 \\ \hat{\beta}_2 &= \hat{\alpha}_0 + 2\hat{\alpha}_1 + 4\hat{\alpha}_2 \\ \hat{\beta}_3 &= \hat{\alpha}_0 + 3\hat{\alpha}_1 + 9\hat{\alpha}_2 \end{aligned} \quad (4.17)$$

4.5 Data

The static and the Almon distributed-lag models outlined above are tested on annual data from 1965 through 1988. In order to facilitate data transformation into logarithms trade balance is expressed as a ratio of export and import values. The value of exports and imports are from the Reserve Bank of Malawi. P_N is measured as the GDP deflator of the Government of Malawi; real domestic income is represented by GNP; real foreign income is proxied by the world production index (World Bank; IMF).

4.6 Empirical Estimation

Estimation of an Almon distributed lag model requires prior knowledge of the length and order of the lag structure. According to Gujarati (1988) the degree of the polynomial should be at least one more than the number of turning points in the curve relating to the coefficients to be estimated. Since a J-Curve has two turning points a third degree polynomial would be the appropriate theoretical specification. However, the size of data in this analysis does not appear to be sufficiently large to capture the full adjustment behavior associated with the J-Curve phenomenon. Thus, in determining the appropriate lag

structure, the minimum polynomial order was set to 2. Since the lag length can not be less that the polynomial degree, the minimum lag length was also set to 2. Based on Laffer's study and in order to minimize the problem of degrees of freedom, a five year lag was chosen as the upper bound.

Table 4.1 Determination of Lag Length

Variable	Two Lags	Three Lags	Four Lags	Five Lags
AIC	-3.678	-3.772	-3.717	-3.517
SC	-3.282	-3.323	-3.219	-2.971

AIC = Akaike Information Criterion;
SC = Schwartz Criterion;
* = Significant at 95 percent confidence level; and ** = Significant at 90 percent confidence level.

The length of the polynomial for the Almon distributed-lag model was determined by sequential testing of restricted models with reduced lag lengths against an unrestricted upper bound model. The Akaike Information Criterion (AIC) and Schwartz-Criterion (SC) statistic as discussed in Judge et al. were used to choose lag length. Test results, as presented in Table 4.1, suggest a three-year lag as an appropriate polynomial length. Estimates of both Akaike Information Criterion and the Schwartz Criterion are lowest in the model with three lags.

Table 4.2 Determination of Order of Polynomial

Variable	2nd Degree	3rd Degree
LLF	18.022	18.683
LRT	1.322	
AIC	-3.756	-3.772

A sequential testing procedure was also used in discriminating between lower and higher order polynomials. Table 4.2 presents the test statistics for third order and second order polynomial regression

equations. The Akaike Information Criterion, AIC, for third order and second order polynomial regression equations suggest that a second order polynomial fits the data better. However, the log-likelihood ratio test does not appear to reject the hypothesis that estimates from second and third order polynomial models are not significantly different from each other. This implies that the typical J-Curve responsiveness in Malawi's trade balance may be non-existent.

In order to confirm the absence of the J-Curve phenomenon the second and third order polynomial models with three lags were estimated using ordinary least squares procedure. A static model as specified in equation (4.9) was also estimated to provide a basis for comparison. Results of the static and dynamic models are presented in Table 4.3.

4.6.1 Effect of the Real Exchange Rate on Trade Balance

With the exception of the world income, proxied by the world production index, RWP, the estimated coefficients have the expected signs. The tested hypothesis that currency devaluation leads to an improvement in the trade balance through changes in relative prices or the real exchange rate is not supported by results of the static model. A one per cent increase in the real exchange rate in the static model appears to result in 0.59 per cent rise in trade deficit in the current year.

However, results from distributed lag models suggest that successive deteriorations in the first two years following a devaluation or a one per cent increase in relative prices results in more than 0.90 per cent improvement in trade balance in the third year; but the lagged improvement in the trade balance does not appear to be sufficient to offset the deterioration in the first two years after a devaluation as required for the full expression of the J-Curve phenomenon. The deterioration in the trade balance immediately following a devaluation is expected to be due to a rise in the cost of imports associated with the devaluation.

Table 4.3 . The Effect of Currency Devaluation on Malawi's Trade Balance 1965-1989

	Static Model		Three Lags and 2nd Degree Polynomial		Three Lags and 3rd Degree Polynomial	
Variable	Estimate	S.E	Estimate	S.E	Estimate	S.E
Constant	-3.888*	0.452	-3.152*	0.736	-3.132*	0.740
RGN	-0.314	0.209	-0.479**	0.248	-0.492**	0.254
RWP	0.039	0.056	-0.0136	0.066	-0.012	0.066
RER	-0.590*	0.180	0.109	0.236	0.149	0.294
LRER1	-	-	-0.706*	0.175	-0.807**	0.469
LRER2	-	-	-0.422*	0.163	-0.312	0.496
LRER3	-	-	0.960*	0.282	0.906*	0.361
LIB	-0.490*	0.066	-0.532*	0.051	-0.531*	0.051
PORT	-0.260*	0.072	-0.353*	0.095	-0.350*	0.096
DW	2.231		2.536		2.542	
Adj-R^2	0.887		0.910		0.902	
LLF	16.046		18.656		18.683	
LRT			0.054			
AIC	-3.680		-3.864		-3.772	
SC	-3.385		-3.466		-3.324	

RGN = Real domestic income (GNP);
RWP = Real world production index;
LIB = Dummy for market liberalization policy; and
PORT = Dummy for closure of trade route through Mozambique.
RER = Real effective exchange rate;
LRERi = Lag of the real effective exchange rate, where, i=1.., 5;
ADJ-R^2 = Adjusted R^2;
S.E = Standard error;
LLF = Log likelihood Function;
LRT = Log Likelihood Ratio Test; and
* and ** = Significantly different from zero at the 95 per cent and 90 per cent confidence levels, respectively.

Based on the log-likelihood ratio test, the hypothesis that estimates of the second and third order polynomials are not significantly different from each other is not rejected, confirming the earlier conclusion that the adjustment process in Malawi's trade balance does not follow the typical J-Curve pattern as

theorized in international trade literature. The failure to observe the J-Curve adjustment process in Malawi, might be attributed to the size of data base used in the analysis. Time series data longer than those currently used in the study may provide more insights into the J-Curve effect on Malawi's trade balance.

4.6.2 The Real Income Effects

Both the static and the Almon distributed-lag models suggest that responsiveness of trade balance to changes in real domestic income lies between 0.30 to 0.50. However, changes in foreign income do not appear to have any significant effect on the behavior of trade balance. The income responses are consistent with the aggregate import income elasticities reported for Malawi by Adu-Nyako et al. (1992). The estimates fall within the ranges for a number of low income countries found in a similar study by Bahman-Oskooee. A relatively inelastic trade response to domestic income increase appears to reflect the dominance in imports of intermediate goods for infrastructural, industrial and agricultural development. The lower response of the trade balance to growth in world income highlights the problems Malawi faces from its dependence on raw material exports to western markets.

4.6.3 The Market Liberalization Effect

The estimated effects of the reduction in subsidy and partial liberalization of the domestic market from the three models are relatively similar. Implementation of liberalization policies appear to have been associated with a significant decline in the trade balance of approximately 50 per cent. The negative effect could be attributed to a rise in the expenditure on imports with removal of subsidies or as commodities assume their true opportunity cost. It can be expected to wane with a more efficient allocation of domestic resources following the reduction of price and non-price distortions. However, Wolf (1992) observes that liberalization would achieve the desired results only if a devaluation results in a reduction in domestic demand. In interpreting the anomaly in the sign of the liberalization parameter, the relatively recent date since the policy was implemented should be noted. The incomplete nature of the liberalization policies may also be a feature (Sahn et al. 1990; Mtawali 1993).

4.6.4 The Trade Route Effect

As expected, the closure of the Mozambique port had a negative impact on the trade balance. The static and Almon distributed-lag models indicate estimates of 26 to 35 per cent. Rerouting of cargo following the closure of the traditional trade route led to increased haulage cost and thus increased the cost of imports and reduced net export earnings for Malawi.

4.7 Conclusion

This chapter tests the hypothesis that currency devaluation leads to an improvement in trade balance through changes in the real exchange rate. The results do not appear to support this hypothesis. Dynamic models indicate the existence of a lagged adjustment. A one percent change in the real exchange rate appears to be associated with a 0.90 per cent rise in the trade balance three years after the devaluation. Since the lagged trade balance responsiveness to a change in the real exchange rate does not sufficiently offset the decline in the first two years, the full effect of the hypothesized J-Curve effect does not apply.

The analysis suggests that a one percent rise in real domestic income would result in 30 to 50 percent reduction in the trade balance whereas changes in real foreign income do not appear to have any discernible effect on trade balance. The unresponsiveness of the trade balance to changes in foreign income may be attributable in part to the unmanufactured nature of Malawi's export commodities and also to the development of unfavorable market conditions in the major importing western countries. Tobacco, in particular, is a major source of export earnings and this commodity faces market problems in the west since it is classified as a health hazard. Sugar, another export, faces limited and distorted world markets. The effectiveness of the exchange rate policy appears to have been partly limited by the disturbance and eventual closure of the Mozambique port, a feature that highlights the difficulty for domestic policy of dealing with external factors and disturbances.

Evidently, an extended mix of domestic and external policy changes may be necessary to achieve the desired improvements in trade balance. Proposals have included regional integration (Koester 1993), further domestic market liberalization (Valdes 1993) and the need for more open importing policies in

developed country markets.

4.8 Bibliography

Adu-Nyako, Gottret, Weatherspoon and Seale. "Macroeconomic Linkages Among Import Demand, Food Demand, and Foreign Debt." *Agricultural Restructuring in Southern Africa* (Csaki, C., Dams, Th. J., Metzger, D., and Van Zyl, J., eds.) International Association of Agricultural Economists, 1992:163-76.

Bahman-Oskooee, M. "Devaluation and the J-Curve: Some Evidence from LDC's." *Review of Economics and Statistics*, (1985):500-504.

Carbaugh, R. J. *International Economics*. Cambridge, Massachusetts: Winthrop Publishers, Inc, 1980.

Gujarati, D. *Basic Econometrics*. 2nd ed. McGraw Hill: New York, 1988.

Himarios, D. "The Effects of Devaluation on the Trade Balance: Results." View and Reexamination of Mile's 'New Results'." *Journal of International Money and Finance*, (Dec. 1985).

International Monetary Fund. *International Financial Statistics Yearbook*. IMF: Washington, 1993.

Judge, G.R., H.W. Griffiths, H. Lutkepohl, and T.C. Lee. *Introduction to the Theory and Practice of Econometrics*. 2nd ed. John Wiley and Sons: New York, 1988.

Koestler, U. "Agricultural Trade Between Malawi, Zambia and Zimbabwe: Competitiveness and Potential." *Agricultural Reforms and Regional Market Integration in Malawi, Zambia, and Zimbabwe*. (A. Valdes and K. Muir-Leresche, eds.) IFPRI: Washington, 1993:32-76.

Laffer, A. B. "Exchange Rates, The Terms of Trade, and the Trade Balance." Mimeographed. University of Chicago, February 1973.

Miles, M. A. "Re-Evaluating the Effects of Devaluation." Mimeographed. University of Chicago, October 1974.

Mtawali, K.M. "Malawi." *Agricultural Policy Reforms and Regional Market Integration in Malawi, Zambia, and Zimbabwe*. (A. Valdes, K. Muri-Lereshche, eds.) International Food Policy Research Institute: Washington, 1993.

Reserve Bank of Malawi. *Financial and Economic Review* XXII(4):1990.

Sahn, D.E., J. Arulpragasam, and L. Merid. *Policy Reform and Poverty in Malawi: A Survey of Decade*

of Experience. Cornell Food and Nutrition Policy Program Monograph 7. 1990.

Salant, M. "Devaluations Improve the Balance of Payments Even if Not the Trade Balance." Mimeographed. U.S. Treasury Department, January 1975.

Steinherr, A. "The Effectiveness of Exchange Rate Policy for Trade Account Adjustment." *I.M.F Staff Papers*, 28(1981):199-225.

Stern, R. M. *Balance of Payments, Theory and Economic Policy*. London: Macmillan, 1973.

Wolf, P. "A Double-Edged Sword: Liberalization May Lead to Instability". *Development and Cooperation*. Berlin: German Foundation for International Development, 1992.

World Bank. *World Tables*. Johns Hopkins Press: Baltimore, 1990.

Valdes, A. "The Macroeconomic and Overall Policy Environment Necessary to Complement Agricultural Trade and Price Policy Reforms." *Agricultural Policy Reforms and Regional Market Integration in Malawi, Zambia, and Zimbabwe*. (A. Valdes and K. Muri-Leresche, eds.) IFPRI: Washington, 1993:11-31.

White, K.J., J.A.J. Boyd, S.D. Wong and D. Whistler. *Shazam: Econometrics Computer Program, User's Reference Manual, Version 7.0*. New York: McGraw-Hill Book Company, 1993.

Part III

Absorption Approach to the Analysis of Balance of Payments

Chapter 5.

Expenditure Switching Effect of A Currency Devaluation

5.1 Introduction

One hypothesis advanced in favor of a currency devaluation is that, as a result of a devaluation, consumption of domestic goods, relative to imported goods, will increase due to a rise in the price of foreign exchange. The substitution of domestic goods for imported goods after a devaluation implies a switch in expenditure from the latter to the former. However, the results obtained in the analysis of the effects of a devaluation on trade balance that are reported in Chapter 2 suggest that Malawi still continues to import more than it exports after successive devaluations of the Kwacha. One implication of the findings outlined in Chapter 2 is that after a devaluation, the consumption of imported goods, relative to domestic goods, does not decline sufficiently to offset a rise in the import bill, contrary to the suggestion of the expenditure switching hypothesis. For the expenditure switching hypothesis to hold, the signs of the cross price elasticities of demands for traded and non-traded goods must be positive. The specific purpose of this chapter is to estimate whether consumption of non-traded goods increases with an increase in the price of traded goods. In addition, this chapter attempts to determine, for the case of Malawi, whether devaluation affects levels of consumption through price and income effects, as is hypothesized by trade theory.

5.2 Theoretical Model

The models of a dependent economy developed by Swan (1963) and Salter (1959), in which commodities are aggregated into sectors, one producing traded and the other non-traded goods, has become a dominant framework for analyzing economy-wide effects of policy changes in small open economies. Figure 5.1 demonstrates that relative consumption decisions for the two goods are determined by the ratio of traded to non-traded goods prices, P_T/P_N. As discussed in Chapter 2, the price ratio P_T/P_N can be

viewed as a measure of the real exchange rate. A rise in this price ratio following a devaluation, holding real incomes constant, makes traded goods more expensive than non-traded goods. Thus, through a relative price effect, consumption of non-traded goods is expected to rise relative to traded goods. The decline in the volume of traded goods, in turn, is expected to reduce the deficit in the balance of payments.

A devaluation is also expected to induce changes in real income which may affect demand for domestically produced goods (through a real income effect). However, Lizondo and Montiel (1989) observe that the effect of a devaluation on real income, for a given level of output, depends on whether traded goods have a higher share in consumption or in income. To demonstrate the ambiguity of the real income effect of a devaluation, Lizondo and Montiel define the general price level as:

$$P = e^{\beta} P_N^{1-\beta} , \tag{5.1}$$

where β is the share of traded goods in total private consumption, and e is the nominal exchange rate. This definition assumes that the price of traded goods is unity. Real income is defined as:

$$Y = Y_N e^{-\beta} + Y_T e^{-\beta} , \tag{5.2}$$

where Y_N and Y_T are levels of production in the non-traded and traded goods sectors, respectively. Differentiating equation (5.3) with respect to e, holding Y_N and Y_T constant, yields:

$$\frac{\partial Y}{\partial e} = e^{-1} (\alpha - \beta) (Y_N e^{-\beta} + Y_T e^{1-\beta}) \gtrless 0 \tag{5.3}$$

where α is the share of traded goods in total output:

$$\alpha = (eY_T)/(eY_T + Y_N) . \tag{5.4}$$

Equation (5.4) indicates that the impact on real income depends on whether traded goods have a higher share in consumption or in income. Thus a variety of results can be expected with respect to the income effect of a devaluation.

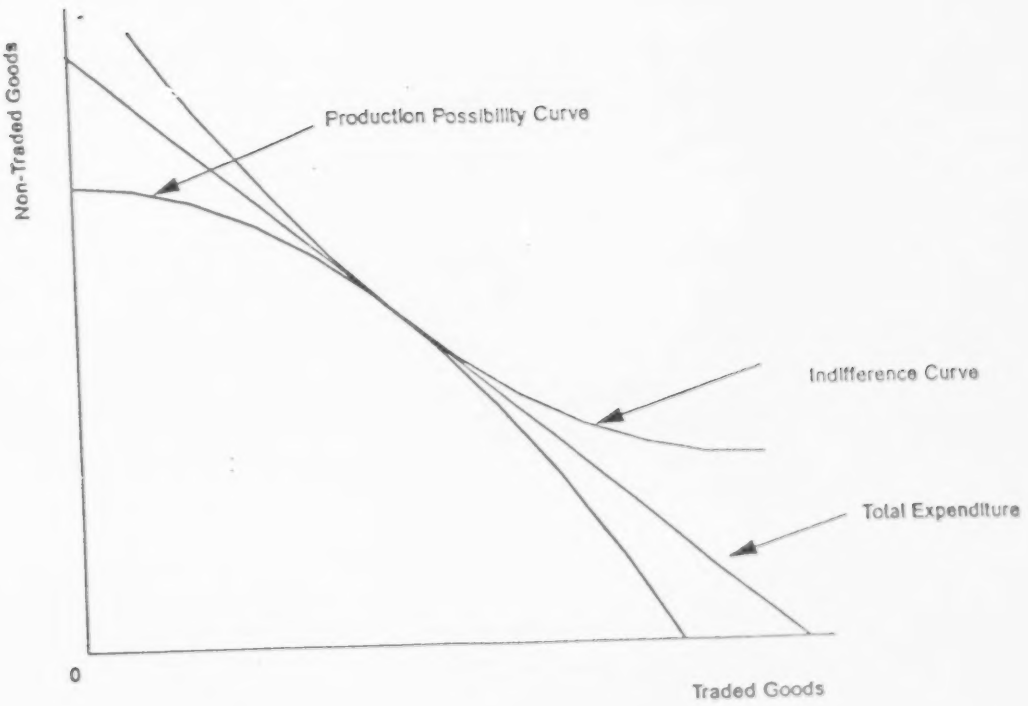

Figure 5.1 A Diagramatical Presentation of the Swan-Salter Model

5.3 Literature Review

A model developed by Sjaastad (1980) has been used by Garcia (1981), Tshibaka (1986), Oyejide (1986) and Mlambo (1989) to analyze the relationship between traded and non-traded goods in Colombia, Zaire, Nigeria and Zimbabwe, respectively. The Sjaastad model estimates an incidence parameter, ω, which is proposed to measure the proportionate change in the price of non-traded goods relative to the price of exported goods as a function of the proportionate change in the price of importables relative to the price of exportables. An incidence parameter value of "unity" would indicate that traded and non-traded goods

are substitutes.

A major weakness of this approach is that it is based on a model that assumes no cross-price effects between tradables and non-tradables (or importables and exportables), and no shifts in demand and supply. The model also assumes that expenditure and income are equal and that the balance of payments are in equilibrium. Since exchange rate changes are expected to influence consumption of traded and non-traded goods though both the price and income effects, the assumption of no cross-price effects and constant income may be unrealistic. Some of the results that researchers have found using the Sjaastad model appear counter-intuitive. For example, studies by Tshibaka and Mlambo obtained incidence parameter values that indicate that cassava and maize are substitutes to importables. In countries such as Zaire and Zimbabwe, these commodities are major staples, and may be traded only after desired self sufficiency levels have been attained.

In order to isolate the price and income effects of a devaluation, conventional analysis of consumer behavior is explored in this study. Consumer expenditure and price elasticities for African countries have been documented in a number of studies including Poleman (1961) Ostby and Gulilat (1969), Massell and Heyer (1969), Leurquine (1960), Dutta-Roy and Mabey (1969), Massell and Parnes (1969), King and Byerlee (1978), Simmons (1976), Strauss (1981) Delgado and Reardon (1987), Kennedy and Cogill (1987), and Quinn and Cohen (1988). Most of these studies find that the standard hypotheses of consumer theory can generally be expected to hold provided it is recognized that most of the households are of low income and, therefore, their food expenditures will be dominated by consumption bundles that are typical of low income households (Eicher and Baker 1992. However, none of these studies have incorporated the price and income effects of exchange rate changes in the analyses.

Expenditure switching in the analysis of conventional consumer demand implies that the cross-price elasticity of demand between tradable and non-tradable goods should be positive and raises the question of choice of utility function and estimation techniques. The price and income effects of a devaluation on consumption of traded and non-traded goods can be interpreted to imply that the coefficients of a devaluation variable and its interaction with the parameters of slope and intercept should be significantly

different from zero in the respective demand functions.

5.4 Theory of Demand

Utility maximization provides the underlying theoretical framework for the estimation of consumer demand. Utility functions measure the relative levels of satisfaction that an individual obtains from the consumption of different bundles of goods, subject to a budget constraint. Following Hassan and Johnson (1976) an individual's utility function is depicted as:

$$U=u(q) \tag{5.5}$$

where $q = (q_i)$ represents an n-element vector of levels of consumed commodities, $\frac{\partial u}{\partial q_i} > 0$, and $u_{ij} = \frac{\partial^2 u}{\partial q_i \partial q_j} = \frac{\partial^2}{\partial q_j \partial q_i} = u_{ji}$ $(i, j = 1, 2, \ldots, n)$. The Lagrangian function to achieve constrained maximization is:

$$L(q, \lambda) = u(q) - \lambda(p'q - E), \tag{5.6}$$

where p is an n-element column vector of prices, (p_i), E is the total expenditure, and λ is a Langrangian multiplier, interpreted in equilibrium as the marginal utility of income. The utility function (5.5) is assumed to be monotonically increasing, strictly quasi-concave, and twice differentiable. A function is strictly increasing if $u(q_2) > u(q_1)$ whenever $q_2 > q_1$, and is strictly quasi-concave if $[\lambda q_1 + (1 - \lambda q_2)] \geq$ min [u(q1), u(q2)] for all q1, q2 in an interval (a, b), and all $0 \leq \lambda \geq 1$. Differentiating equation (5.6) with respect to qi and λ yields the first order conditions:

$$u_q = \lambda p = 0, \tag{5.7}$$

where u_q is a vector of derivatives of the utility function with respect to quantities q, (i = 1, 2, ..., n). From (5.7), the second order conditions, which ensure that the utility function u is strictly quasi-concave, are derived:

$$q'Uq \leq 0 \tag{5.8}$$

for all q such that p'q = 0, where U is a Hessian matrix of the following structure:

$$U = \begin{bmatrix} u_{11} & U_{12} & \cdots & u_{1n} \\ u_{21} & u_{22} & \cdots & u_{2n} \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ u_{n1} & u_{n2} & \cdots & u_{nn} \end{bmatrix} \tag{5.9}$$

The first order conditions in (5.7) can be used to derive a system of Marshallian demand equations q_i in terms of prices, p_i (i = 1..., n), and expenditure, E; i.e.,

$$q_i = (p_1, \ldots, p_n, E) \tag{5.10}$$

$$\lambda = \lambda(p_1 , \ldots, m) \tag{5.11}$$

The demand functions, qi, in (5.10), define the consumers's behavior under different sets of alternative prices and a given income level, whereas λ in equation (5.11) represents the marginal utility of income.

Duality theory provides an alternative approach to analyzing consumer behavior. Based on the concept of expenditure minimization, a consumer is expected to select a bundle of goods that minimizes the outlay necessary to attain the desired level of utility, u; i.e., to minimize $\Sigma p_k q_k$ subject to v(q)=u. The solution to the expenditure minimization problem yields Hicksian or income compensated demand functions h(u, p) which are dual to the Marshallian demand functions since they both define the same choice and optimal values of q. Figure 5.2 provides a diagrammatic representation of the interelationships of these dual processes, as illustrated by Deaton and Muellbauer (1993).

Consumer demand analysis applies the notion of a simple linear budget constraint; i.e.,

$$E = \sum_k p_k q_k \tag{5.12}$$

where E is the total expenditure, and q_i are quantities of goods. Equation (5.12) rules out non-linearities, indivisibilities, uncertainties, and interdependencies.

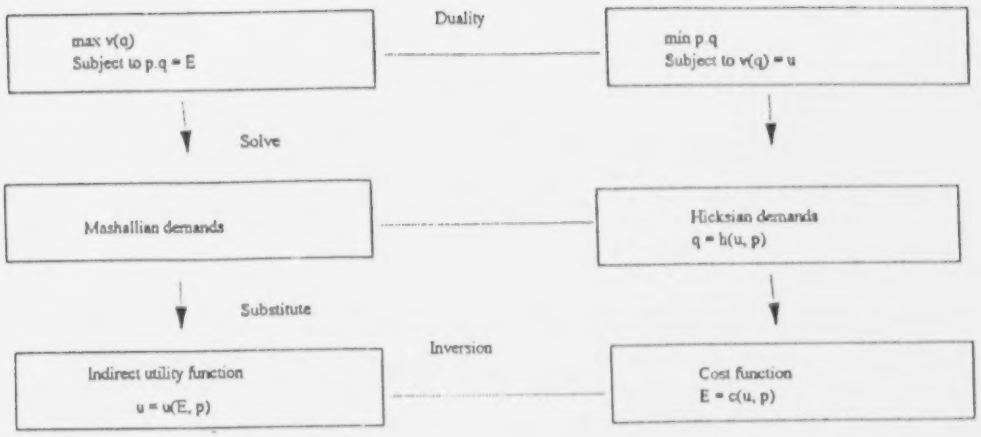

Figure 5.2 Utility Maximization and Cost Minimization

5.4.1 Properties of Demand Functions

The constrained utility maximization framework confers unique and testable propositions on demand functions. One of these propositions requires that the demand functions satisfy the budget constraint; i.e.,

$$\sum_k p_k \, H_k(u, p) = \sum_k p_k \, g_k(x, p) = E \, . \tag{5.13}$$

This proposition is referred to as the adding-up restriction. Specifically, the adding-up condition requires

that any adjustment in the consumption bundle resulting from changes in p, in both Marshallian and Hicksian demand functions, and in E in the former, do not violate the budget constraint. Thus:

$$\sum_k pk\frac{\partial g_k}{\partial E} = 1 \; ; \; \sum_k p_k\frac{\partial g_k}{\partial p_i} + q_i = 0. \tag{5.14}$$

Implicit in the linear budget constraint in equation (5.13) is that Hicksian demand functions are homogeneous of degree zero in prices, and the Marshallian demand functions are homogeneous of degree zero in both prices and total expenditures; i.e.,

$$h_i(u, \theta p) = h_i(u, p) = g_i(\theta E, \theta p) = g_i(E, p) \tag{5.15}$$

In terms of a Marshallian demand function, homogeneity implies that a proportionate change in p and E will not alter the consumption of good i,

$$\sum_k p_k\frac{\partial g_k}{\partial E} + E\frac{\partial g_i}{\partial E} = 0 \tag{5.16}$$

Deaton and Muellbauer observe that Hicksian demands are homogeneous of degree zero since they are derived from a function that is homogeneous of degree one and that for a given indifference curve, relative prices are all that are required to determine demand. To ensure consistency in consumer's choice, the Hicksian demand functions must satisfy the symmetry condition. The symmetry condition stipulates that the Hicksian cross-price derivatives must be equal for each pair of goods, i.e.,

$$\frac{\partial h_i(u, p)}{\partial p_j} = \frac{\partial h_j(u, p)}{\partial p_i} \sim i \neq j \; . \tag{5.17}$$

Another condition related to consistency and rationality in consumers choice is negativity. This condition requires that the n by n matrix formed by the elements $\partial h_i / \partial p_j$ be negative semi-definite,i.e.,

$$\sum_i \sum_j \zeta_i \zeta_j \, \partial h_i / \partial p_j \leq 0 \tag{5.18}$$

where ζ is a quadratic form.

5.5 Empirical Model

5.5.1 Almost Ideal Demand System (AIDS)

Estimates of price and expenditure elasticities in a number of African countries have been based on single equation models which may provide acceptable estimates but are not amenable to testing the standard restrictions that are consistent with the theory of consumer behavior. In this study, an Almost Ideal Demand System (AIDS), developed by Deaton and Muellbauer from a flexible consumer expenditure function, is applied to the estimation of price and expenditure elasticities for goods in private consumption which include domestically manufactured goods and imports (traded goods), and subsistence goods such as maize and other home grown crops not destined for the market (non-traded goods). The AIDS model not only satisfies the axioms of choice, but also, as discussed earlier, belongs to a PIGLOG class of functional forms that meet the criteria for aggregation. Numbers of authors including Blanciforti, Green and King (1986), and Eales and Unnevehr (1988) have applied the AIDS model to aggregate data for food at the national level.

The AIDS functional form, as derived by Deaton and Muellbauer, is as follows:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln(p_j) + \beta_i \ln(E/P) \tag{5.19}$$

where w_i is the expenditure share of the ith commodity, p_j are prices, E is the total expenditure on all commodities in the system, α_i, γ_{ij}, and β_i are demand parameters, and P is a price index defined as:

$$\ln P = \alpha_0 + \sum_i \alpha_i \ln(p_i) + \frac{1}{2}\sum_i \sum_j \gamma_{ij} \ln(p_i) \ln(p_j) \tag{5.20}$$

where (i, j) = 1, ..., 3 are traded and non-traded commodities. The parameter α_i represents the budget share of the ith commodity, holding relative prices and real expenditure constant, whereas γ_{ij} represents the change in the ith commodity budget share resulting from a unit change in the price p_j, holding real expenditure constant, and β_i measures the effect of the $_i$th budget share of a change in the real expenditure.

The basic postulates of demand theory require that:

$$\sum_i \alpha_i = 1 \ , \ \sum_i \gamma_{ij} \ , = 0 \ , \ \sum_i \beta_i = 0 \qquad \text{(Adding-up condition),} \qquad (5.21)$$

$$\sum_i \gamma_{ij} \ , = 0 \qquad \text{(Homogeneity of degree zero), and} \qquad (5.22)$$

$$\gamma_{ij} = \gamma_{ji} \qquad \text{(Slutsky symmetry).} \qquad (5.23)$$

These conditions may either be imposed or tested.

The standard AIDS system of equations, (5.19), is non-linear in parameters. Deaton and Muellbauer suggest linearizing the function by approximating the price index with Stone's index, $\ln (P) = \Sigma_i w_{ji} \ln (p_{ji})$. The AIDS model in which the price index is replaced by the Stone's index is referred to as the Linear Approximate AIDS model(LA/AIDS).

In order to incorporate persistence in habits and the possibility of dynamic behavior in consumer demand, Chen (1991) uses a "dynamic translating procedure" proposed by Pollack (1970) and Pollack and Wales (1981). The procedure involves specifying the budget share equation for good i as:

$$W_i = \alpha_i + W_i(P, E - \sum p_i \alpha_i) \qquad (5.24)$$

where $\alpha_i = \alpha_i^* + \lambda_i q_{t-1}$ and λ_i is the coefficient that measures the impact of the previous consumption, q_{t-1}, on the current expenditure of commodity i. Using the cost minimization process, $c(u(q), p) = \min_q \{pq: u(q) = u_0\}$ from which the original AIDS models is derived, a dynamic cost minimization problem is expressed as:

$$c(u(q), p) = \min_{q^*} \{pq^*: u(q^*) = u_0\} \qquad (5.25)$$

where $q^* = q - \alpha$. Utility maximization implies that the consumer, facing prices P and the budget share

$(E - \Sigma p_i - a_i)$, chooses $(q - a)$. Since the system of original demand equations is expected to satisfy first order conditions for cost minimization, the transformed system of equations is also expected to satisfy these conditions.

The AIDS model incorporating habit persistence is therefore specified as:

$$w_i = \alpha_i^* + \lambda_i q_{t-1} + \sum_j \gamma_{ij} + \beta_i(\ln E - \ln P) \quad \sim \quad i, j = 1,\ldots n \tag{5.26}$$

where

$$\ln P = \alpha_0 + \sum_j (\alpha_i^* + \lambda_i q_{it-1})\ln P_j + \frac{1}{2}\sum_i \sum_j \gamma_{ij} \ln P_i \ln p_j$$

The adding-up conditions for the modified AIDS models are as follows:

$$\sum \alpha_i = 1 \,, \sum_i \gamma_{ij} = \sum \beta_i = \sum \lambda_i = 0 \,. \tag{5.27}$$

The restriction $\Sigma\lambda_i$ requires that at least one of the λ_i be negative. A positive sign on λ signifies habit persistence, whereas a negative sign signifies inventory depletion effects.

Price and income effects of a devaluation are incorporated into the analysis by introducing a devaluation shock variable, DEV, to equation (5.19) as follows:

$$\begin{aligned} w_i = {} & \alpha_i^* + \delta_i dev + \sum_j \gamma_{ij} \ln p_j + \sum \gamma\delta_{ij} \ln(p.\, dev)_j + \\ & \beta_i(\ln E - \ln P) + \beta\delta_i(\ln(E.\, dev) - \ln(P dev)) \quad \sim \quad i, j = 1,\ldots 3 \end{aligned} \tag{5.28}$$

where

$$\ln P dev = \alpha_0 + \sum_j (\alpha_i^* + \delta_i dev_{it-1})(\ln P.dev)_j + \frac{1}{2}\sum_i \sum_j \gamma.\delta_{ij} \ln P_i.dev.\ln p_j$$

Adding-up conditions for equation (5.34) are based on Pollack's translating procedure, i.e.,

$$\sum \alpha_i = 1 \,, \sum_i \gamma_{ij} = \sum \gamma\delta_{ij} = \sum \beta_i = \sum \beta\delta_i = \sum \delta_i = 0 \,. \tag{5.29}$$

The hypothesis that devaluation has a price and income effect on consumption of traded and non-traded goods imply that the coefficients δ_i, $\gamma\delta_{ij}$, and $\beta\delta_i$ are significantly different from zero.

5.5.2 Weak Separability

The theory of consumer behavior assumes that the decision to allocate current expenditure into various broad categories of goods can be made separately from the decision of how to arrange the intertemporal flow of expenditure. The problem of determining whether consumers perceive some goods as providing the same utility and whether these goods can be aggregated into broad categories is an empirical issue. An early attempt to aggregate commodities into groups for analytical purposes proposed to aggregate commodities that can be considered substitutes or commodities whose prices tend to move in parallel. However, the composite commodity approach did not prove to be that useful.

A more practical approach to preference ordering is referred to as separability. Separability exists if commodities can be partitioned into groups such that preferences within groups can be described independently of the quantities in other groups. Implicit in the possibility of separable preferences are that sub-utility functions for each group of commodities combine to give total utility, i.e.,

$$u = v\,(q_1, q_2, q_3, q_4) = f\,[v_F(q_1, q_2), v_S(q_3, q_4)] \tag{5.30}$$

where f( ) is some increasing function and v_F,and v_S are the sub-utility functions associated with commodities q_1 to q_4. These groupings can also be considered in the context of as a utility tree as illustrated in Figure 5.3.

From the utility tree, the problem of allocating total expenditure can be perceived as a two-stage budgeting process; at the first or higher stage, expenditure is allocated to broad groups of goods (food, shelter and entertainment), while at the second, or lower stage, group expenditures are allocated to the individual commodities. Deaton and Muellbauer observe that although the concepts of separability of preferences and two-stage budgeting are intimately related, they are by no means equivalent. However, separability, as depicted in equation (5.30), an example of "weak separability", is both necessary and sufficient for the two-stage budgeting.

Application of weak separability in demand analysis allows commodity demands in each period

to be defined as a function of total outlay and prices for the items in that group and in that period. A major advantage for restricting commodity expenditure to group outlay and prices is that it reduces the number of variables required to explain consumer behavior in econometric analysis. Although the concept of separability is desirable, strong separability imposes severe restrictions on the degree of substitutability between goods in different groups (Deaton and Muellbauer).

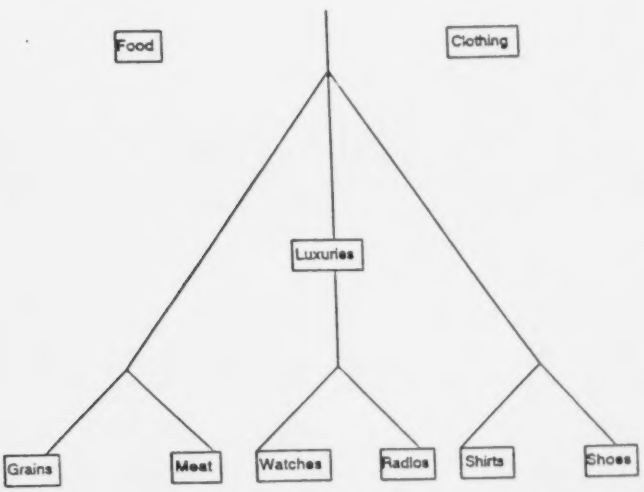

Figure 5.3 A Hypothetical Utility Tree

Source: Deaton. A, and J. Muellbauer. Economics and Consumer Behavior. Cambridge University Press: Cambridge, 1989.

A test for weak separability, based on Goldman and Uzawa (1964), as discussed in Eales and Unnevehr, will be applied to test for weak separability. According to Goldman and Uzawa, the necessary and sufficient condition for weak separability is that the off-diagonal term in the Slutsky substitution matrix is proportional to the income derivatives of the two separable goods. If goods i and j are in separable

groups r and s, respectively, then

$$S_{ij} = \Theta^{rs} \frac{\partial Q_i}{\partial E} \frac{\partial Q_j}{\partial E}, \qquad i \in r, \text{ and } j \in s \tag{5.31}$$

where S_{ij} is the appropriate element in the Slutsky substitution matrix, Q's are quantities consumed and Θ^{rs} is a factor of proportionality between groups r and s. The compensated effects of price changes of goods in other groups are felt only through the reallocation of expenditures among groups. Following Eales and Unnevehr, an adjusted non-linear Wald statistic will be used to test for weak separability among non-traded goods, imports and domestically manufactured goods. The test statistic involves restrictions based on equation (5.31). Out of three commodities considered in the study (non-traded goods, imports, and domestically manufactured goods), there can be three possible paired choices (3! / (1! 2!)) of which only one is independent, thus three different ways of calculating Θ^{rs}. Failure to reject one of the three restrictions implies the presence of weak separability. The generic expression of the restrictions for commodities i to j in group r and k takes the form:

$$\frac{S_{ik}}{\partial Q_i / \partial E} = \frac{S_{jk}}{\partial Q_i / \partial E}, \qquad i \in r, \text{ and } j \in s. \tag{5.32}$$

In the AIDS model, the restriction translates into:

$$\gamma_{ik}(\beta_j + w_j) - \gamma_{jk}(\beta_i + w_i) + (w_i\beta_j - w_j\beta_i)(w_k - \beta_k \ln(E/P)) = 0, \qquad i, j, \in r, \text{ and } k \in s, \tag{5.33}$$

tested locally at mean shares, where ω_i is the $_i$th commodity budget share, and γ_i is the ith element of the substitution matrix. Eales and Unnevehr observe that small sample properties of the Wald test are unknown. Monte-Carlo evidence cited by the two authors from Gregory, and Veall (1985), Laitinen (1978), Bera, Byron and Jarque (1981), indicate that the empirical size of the test statistic may be much smaller than the normal size, such that the type I error is too small. Following Judge, Griffiths, Hill, Lutekpohl and Lee's recommendation, Eales and Unnevehr apply a degrees of freedom correction to the test statistic and use the cutoff of the appropriate F-distribution in testing for separability. The adjusted

test statistic is said to give a type I error that is closer to that which is specified in finite samples.

5.5.3 Aggregation

The theory of utility maximization relates to choices of an individual consumer. Application of the microeconomics of consumer behavior to the analysis of market demand raises the issue of aggregation. Aggregation theory provides the necessary conditions under which aggregate consumer behavior can be treated as if it were generated by the decision of a single maximizing consumer.

Using Gorman's utility function, Varian demonstrates that aggregate behavior may look as though it were generated by a single "representative" consumer. Assuming that the utility function takes the Gorman form:

$$v_i(p, y_i) = a_i(p) + b(p)y_i \tag{5.34}$$

where p is a vector of commodity prices, and y_i represents each consumers's income, the demand function for good j of consumer i takes the form:

$$q_i^j(p,y_i) = a_i^j(p) + \beta_i^j(p)y_i \; ; \tag{5.35}$$

where,

$$\alpha_i^j(p) = -\frac{\dfrac{\partial \alpha_i(p)}{\partial p_j}}{b(p)}$$

$$\beta_i^j(p) = -\frac{\dfrac{\partial b(p)}{\partial p_j}}{b(p)} \tag{5.36}$$

Equation (5.36) is derived from Roy's identity. Whereas $\alpha_i(p)$ can differ from consumer to consumer, $\beta(p)$ is assumed to be identical for all consumers. The marginal propensity to consume good j, $\partial q_i^j(p, y_i)/\partial y_i$, is independent of the level of income of any consumer and constant across consumers since $\beta(p)$ is constant across consumers. The aggregate demand for good j is expressed as:

$$X^j(p, y^1, \ldots, y^n) = -\left[\sum_{i=1}^{n} \frac{\partial \alpha_i}{\partial p_j} \Big/ b(p) + \frac{\partial b(p)}{\partial p_j} \Big/ \partial b(p) \sum_{i=1}^{n} y_i\right]. \tag{5.37}$$

The demand function (5.37) can also be generated by a representative consumer whose indirect utility function is given as:

$$V(p, Y) = \sum_{i=1}^{n} \alpha_i(p) + b(p)Y = A(p) + B(p)Y\ , \tag{5.38}$$

where $Y = \sum_{i=1}^{n} y_i$. The Gorman form is the most general form of the indirect utility function that allows for aggregation in the sense of a representative consumer model (Varian). Special cases of the Gorman form include homothetic, quasi-homothetic and quasi-linear utility functions. The price-independent generalized logarithmic (PIGLOG) class of functional form, from which the Almost Ideal Demand System (AIDS) model is derived, falls in the Gorman polar form. For a detailed discussion of the relationship of these functional forms see Deaton and Muellbauer (1993), and Varian (1992).

Although functional forms that can facilitate consumer aggregation exist, Deaton and Muellbauer argue that it is neither necessary nor desirable that macroeconomic relations should replicate their microeconomic foundations to provide for exact aggregation. Their argument follows that of Hicks (1956) who observes that microeconomic theory has greater relevance for aggregate data since variations between individuals average out to negligible proportions in aggregate, leaving only systematic effects of variations in prices and budget. The conditions of quasi-homotheticity or quasi-linearity may be too stringent to allow for commodities consumed at low budget levels to be included.

5.6 Data

Annual data for a period of 24 years, 1965 to 1988, are used in the study. Statistics used to generate expenditure shares, such as population figures, total private expenditure and expenditures on goods

imported for final consumption, and domestically manufactured goods were obtained from a series of Malawi government publications, (the *Malawi Statistical Yearbook*, *Monthly Statistical Bulletin*). The unit price index of imports was obtained from the quarterly publication of the Reserve Bank of Malawi, whereas the wholesale price index and the GDP deflator, which are used as proxies for the prices of domestically manufactured goods and non-traded goods, respectively, were obtained from the annual World Bank publication, *World Tables*. Traded goods in total private consumption include imports of goods for final consumption and locally manufactured consumables. The difference between total private consumption and traded goods constitute non-traded consumption goods.

5.7 Empirical Estimation and Results

Frequently, market-level demand is specified as a single equation function of prices and expenditure (income), a formulation implying that prices are exogenous or predetermined. If prices are endogenous, the quantity-dependent single-equation model would be a misspecification and its parameters would be biassed. However, commodity prices in Malawi have for a long time been regulated by the government, implying that consumers have faced predetermined prices. In this respect, it can be assumed that the prices used in estimating the traded and non-traded demand functions are exogenous. The linear and nonlinear AIDS models specified in (5.19) were estimated through seemingly unrelated regressions (SUR) and nonlinear seemingly unrelated (NL-SUR) procedures, respectively. The demand equations were also estimated using linear and non-linear three stage least squares for comparative purposes. Instruments used in the three stage least squares included price indices for non-traded goods and imports, lagged consumption levels, wages, GDP, and time trend. Dynamic versions of the LA/AIDS and AIDS models, which incorporate potential persistence in habits involving a partial adjustment framework, were also estimated. Since the sum of expenditure shares equals the exact linear combination of regressors, one equation, the expenditure share for domestically manufactured goods, was deleted in all the estimations. Choice of the deleted equation was arbitrary since the estimates are invariant to the equation that is deleted.

Table 5.1 Seemingly Unrelated Regression (SUR) Estimates of the Linear Approximation of the AIDS (LA/AIDS) Model

	Static Model		Dynamic Model	
Parameter	**Estimate**	**S.E**	**Estimate**	**S.E**
α_1	0.665*	0.043	0.621*	0.047
$(1-\lambda_1)$	-	-	0.024	0.024
γ_{11}	0.207*	0.043	0.217*	0.043
γ_{12}	-0.059*	0.017	-0.064*	0.018
γ_{13}	-0.148*	0.034	-0.153*	0.031
β_1	-0.056*	0.014	-0.057*	0.014
α_2	0.149*	0.025	0.079	0.031
$(1-\lambda_2)$	-	-	0.121*	0.042
γ_{22}	0.013	0.010	0.010	0.010
γ_{23}	0.047*	0.016	0.054*	0.014
β_2	0.035*	0.007	0.020*	0.008
α_3	0.187*	0.043	0.300*	0.044
$(1-\lambda_3)$	-	-	-0.150	0.123
γ_{33}	0.101*	0.036	0.099*	0.031
β_3	0.022*	0.011	0.040	0.010
LLF	135.708		137.566	

α_i, β_i, γ_{ij} = the estimated demand parameters, for i, j = 1, ... 3; 1, 2 and 3 represent non-traded goods, imports and domestically manufactured goods, respectively;
λ_i = estimated partial adjustment coefficients, for i = 1, ... 3;
LLF = the value of the log likelihood function; and
* and ** imply significance at 95 per cent and 90 per cent confidence levels, respectively.

One of the major problems encountered in estimating non-linear demand models is the convergence of iterations to a unique solution. Even if the iterations converge to a solution, there is no guarantee that the value of the likelihood function represents a global minimum or maximum, unless it is confirmed using a series of initial parameters. For these reasons, only the SUR and the three stage least squares LA/AIDS estimates, presented in Tables 5.1 and 5.2, respectively, are used in hypothesis testing and making inferences. For comparative purposes, the estimates of the non-linear AIDS model are presented in Tables 5.6 and 5.7 in the appendix.

Table 5.2 Three-Stage Least Squares Estimates of (LA/AIDS) Model

	Static Model		Dynamic Models	
Parameter	**Estimate**	**S.E**	**Estimate**	**S.E**
α_1	0.668*	0.044	0.623*	0.048
$(1-\lambda_1)$	-	-	0.029	0.025
γ_{11}	0.214*	0.044	0.223*	0.044
γ_{12}	-0.059*	0.018	-0.061*	0.018
γ_{13}	-0.155*	0.036	0.016	0.033
β_1	-0.057*	0.014	-0.058*	0.014
α_2	0.150*	0.027	0.089*	0.031
$(1-\lambda_2)$	-	-	0.113*	0.042
γ_{22}	0.013	0.011	0.012	0.010
γ_{23}	0.046*	0.017	0.049*	0.014
β_2	0.035*	0.007	0.022*	0.008
α_3	0.182*	0.047	0.089*	0.046
$(1-\lambda_3)$	-	-	-0.142	0.098
γ_{33}	0.109*	0.039	0.112*	0.033
β_3	0.022*	0.011	0.036*	0.011
SO.	17.700		16.770	

SO = a statistic defined in equation (5.41).

With the exception of the imported own goods price coefficient and the coefficient for the lagged non-traded consumption variable, most of the SUR and three-stage least squares parameter estimates in both the linear and non-linear AIDS models are significantly different from zero at and generally acceptable in magnitude. The non-linear SUR AIDS estimates are similar in sign and magnitude to the LA/AIDS parameter estimates.

The theory of consumer behavior concludes that demand equations satisfy homogeneity and Slutsky symmetry restrictions. A standard procedure that was adopted to assess the appropriateness of the estimated demand functions was to estimate the share equations with and without imposing symmetry and

homogeneity, and compare the coefficients from the restricted and unrestricted models using log-likelihood ratio tests, or their variants.

In the case where the three-stage least squares was used, an instrumental analog of the log-likelihood ratio test as discussed by Gallant and Jorgenson (1979), was used to test whether the hypotheses of homogeneity and symmetry apply. The two authors show that, provided regularity conditions are satisfied,

$$\begin{aligned} T_i &= \hat{\mu}'(\Sigma^{-1} \otimes P(W))\hat{\mu} - \mu'(\Sigma^{-1} \otimes P(W))\mu \\ &= \hat{S}_i - S_i \end{aligned} \tag{5.41}$$

is asymptotically distributed with χ^2 (p), where p is the number of restrictions, Σ^{-1} is an m by m estimate of the variance-covariance matrix from two-stage least squares, W is a set of instrumental variables, and S_i is a multi-equation analog of the sum of squared errors (SSE).

The value of the log-likelihood ratio and the instrumental analog of the log-likelihood ratio for the SUR and the three stage least squares estimates, presented in Table 5.3, do not exceed their critical values, indicating that the hypotheses of homogeneity and symmetry in the estimated LA/AIDS models can not be rejected at the 5 per cent level. The results in Table 5.3 also show that consumption of non-traded goods, imported goods, and domestically manufacture goods does not adjust according to the hypothesized stock adjustment process. The test statistics between static and dynamic models do not exceed their critical χ^2 value (5.99) at the 5 per cent level and two degrees of freedom.

The purpose of estimating demand equations is to determine price and expenditure elasticities. The ability, using these elasticities, to predict accurately consumer behavior depends on whether or not the estimated parameters are unbiased and efficient. One of the restrictions that ensures consistency between estimated demand parameters and demand theory is separability, introduced earlier.

Table 5.3 Test of Symmetry and Homogeneity on the LA/AIDS Model

	Seemingly Unrelated Regression		Three-Stage Least Squares			
	Static	Dynamic	Static	Dynamic	Critical Value	No of Restrictions
	LLF	LLF	SO	SO		
Un-Restricted Model	138.77	139.55	14.81	9.56		3
Restricted Model	135.71	137.57	17.70	16.77		3
LLR	6.12	3.86	2.89[1]	7.21	7.81	

LLR = the value of the log likelihood ratio.

Table 5.4 presents the test for weak separability on the LA/AIDS model based on equation (5.33). This tests whether consumers can discriminate between commodities as belonging to separate groups. An Adjusted-Wald statistic in equation (5.42) was used to test whether Malawian consumers perceive non-traded goods, domestically manufacture goods and imports as different from each other, and belong to separate commodity groups.

$$W^{*} = \frac{WD/R}{(EQ*N)/(EQ-K)}, \tag{5.42}$$

where WD is the regular Wald statistic, R is the number of restrictions, EQ is the number of equations, N is the number of observations, and K is the number of free parameters. For the number of goods in the study, consumers are faced with three possible paired choices, between non-traded and domestically manufactured goods, non-traded and imported goods, and domestically manufactured and imported goods. The test statistics in Table 5.4 indicate that the hypothesis of weak separability was rejected only in one of the three possible paired choices, between imported and domestically manufactured goods, between non-traded and imported goods and between non-traded and domestically manufactured goods. Since consumers can only make one independent choice among the three commodities, failure to reject the hypothesis in

[1]Analog of the Log Likelihood Ratio test defined by equation (5.41)

more than one commodity combination, more than satisfies the requirement for weak separability. The substitution matrix from each the LA/AIDS models were checked for sign definiteness and found to be negative semi-definite, satisfying the condition of negativity.

In order to test the hypothesis that currency devaluation leads to an increase in the consumption of non-traded goods and a decline in the consumption of traded goods, through price and income effects, the LA/AIDS models were re-estimated with the devaluation variable and its combinations with the price indices and expenditures included. The estimated coefficients were not significantly different from zero at 5 per cent level, suggesting that Malawi's successive devaluations did not generate any significant positive or negative effects on the consumption of non-traded and traded goods. In contrast, estimates of the LA/AIDS models, without including the devaluation variable or its combination with price and expenditure variables, suggest that Malawi's consumer behavior is consistent with predictions of demand theory.

Although the non-linear AIDS model generates parameter estimates that are similar to those obtained from the LA/AIDS model, the latter yields more significant parameters than the former.

Table 5.4 Weak Separability Test

	Wald Test	DF	Critical Value	Adjusted Wald Test	DF1	DF2	Critical Value
Static Model:							
Non-Traded	12.00	1	3.84	3.54	1	34	4.13
Imported	26.35	1	3.84	10.98	1	34	4.13
Domestic Manufactures	4.17	1	3.84	1.74	1	34	4.13
Dynamic Model:							
Non-Traded	9.09	1	3.84	3.52	1	31	4.15
Imported	16.97	1	3.84	6.58	1	31	4.15
Domestic Manufactures	2.49	1	3.84	0.97	1	31	4.15

DF = degrees of freedom;
DF1 = degrees of freedom for the numerator; and
DF2 = degrees of freedom for the denominator.

The elasticity estimates which are reported in Tables 5.5 and 5.7 are based on the following formulae:

$$\epsilon_i = 1 + \frac{\beta_i}{w_i}, \tag{5.42}$$

and

$$\epsilon_{ij} = \frac{1}{w_i}\left[\gamma_{ij} - \beta_i(\alpha_j + \sum_k \gamma_{jk}\ln p_k)\right] - \delta_{ij} \tag{5.43}$$

where ϵ_i is the total expenditure elasticity, ϵ_{ij} is the price elasticity, and $\delta_{ij} = 1$ for $i = j$ and $\delta_{ij} = 0$ for $i \neq j$. The standard errors for the respective elasticity estimates are estimated using equation (2.10) as discussed in Chapter 2.

Imported goods have the highest own price elasticity, -0.90 (LA/AIDS), and 0.99 (AIDS), followed by the own price elasticity for non-traded goods, -0.69 (LA/AIDS) and -0.71 (AIDS), and the price elasticity for the manufactured goods, -0.43 (LA/AIDS) and -0.25 (AIDS). The estimated cross price elasticities for non-traded goods with respect to imported goods and domestic manufactures are negative, implying that the two latter commodities are complements to the former, and vice versa. However, estimates of the cross price elasticities between imports and manufactured goods are positive, implying that consumers treat these goods as substitutes.

Table 5.5 Estimates of Uncompensated Demand Elasticities of the LA/AIDS Model

	Non-Traded	Imported	Domestic Manufacture	Expenditure
Non-Traded	-0.688 (0.060)	-0.064 (0.019)	-0.129 (0.019)	0.927 (0.018)
Imported	-1.108 (0.217)	-0.896 (0.144)	0.272 (0.305)	1.561 (0.011)
Domestic Manufacture	-0.842 (0.205)	0.299 (0.103)	-0.431 (0.213)	1.128 (0.063)

Figure in parenthesis are standard errors.

The complementarity between non-traded goods and the other two commodities, imports and domestic manufactures, is not very surprising since the non-traded goods comprise mostly raw agricultural produce (maize, groundnuts, cassava, beans and others), whereas the latter are mostly highly processed products. Most of the imported products are not in the basic food category.

Imported goods also have the highest expenditure elasticity followed by manufactured goods and non-traded goods. The expenditure elasticity estimate for non-traded goods is less than one whereas the estimated expenditure elasticities for the other two goods are significantly greater than one at the 5 per cent level. The magnitude of the respective expenditure elasticity estimates is consistent with the expectations of economic theory, specifically, that the budget share of necessities declines and that of luxuries increases with an increase in total expenditure. Non-traded goods are predominantly made of maize, a major staple food for Malawi, whereas imports and domestic goods consist mostly of less basic items such as clothing and textiles, cigarettes, beverages, processed foods, condiments, cosmetics, and electronic items.

The elasticity estimates obtained in this study are comparable to estimates from similar studies conducted for Malawi and other countries in Sub-Saharan Africa. A study by Humphrey and Oxley (1976) involving data from nearly 7500 urban and rural households in Malawi found expenditure elasticities for food, durable goods and household construction to be 0.71, 0.97 and 1.55, respectively. Somewhat higher income elasticities for food, 0.9 for Rwanda and 0.93 for Sierra Leone, have been reported by Leurquin (1960), and King and Byerlie (1978), respectively. Kadu-Nyako, Gottret, Weatherspoon, and Seale (1992) found the price elasticity of demand for imports in Malawi, Botswana and Zambia to be in the range of -0.08 to 0.03 and expenditure elasticities were estimated to be in the range of 0.23 to 0.77. In related consumption studies, Kapunda (1988), Odegaard (1985), and Gerrald (1981) found price and expenditure elasticities for basic staples in Tanzania to lie in the ranges of -0.64 to -0.90 and 0.55 to 0.80, respectively.

The findings of this study have important implications with respect to exchange rate and macroeconomic policies in Malawi and other African countries in which the IMF and the World Bank's structural adjustment programmes have been implemented. Currency devaluations have been pursued to restore internal and external balance through its price and income effects on demand for traded and non-

traded goods. With an increase in the relative price of traded goods and a decline in real income following a devaluation, consumers are expected to substitute non-traded goods for traded goods or to switch their expenditure in favor of the former. The results suggest that currency devaluation alone will not lead to an improvement in trade balance of payments through price and income effects. Specifically, the models that included the devaluation variable and its combinations with the price and expenditure variables yielded coefficient estimates that were not significantly different from zero at 5 per cent level. Further, the estimated elasticities suggest that both imported consumption goods and domestically manufactured goods are complementary to non-traded goods, the bulk of which comprises maize and other unprocessed agricultural produce. The results from this study indicate that domestically manufactured goods and imported consumption goods are substitutes. Thus, an increase in the relative price of imports, following a devaluation, results in an increase in the consumption of domestically manufactured goods. However, although locally manufactured goods and imported goods are substitutes, the proportion of the latter in total private consumption (approximately 0.7 per cent[2]) is so small that the impact of the substitution on the external balance would be expected to be minimal. The bulk of Malawi's imports are goods for intermediate consumption such as fertilizer, pesticides and other industrial chemicals, oil, automotive and industrial products. Few, if any, of these products have close local substitutes. Thus, an increase in the import price after a devaluation is unlikely to induce sufficient substitution effects to achieve restoration of balance of payments equilibrium.

5.8 Conclusion

This chapter presents an analysis of the expenditure switching effect of a currency devaluation in Malawi. The linear approximation to the almost ideal demand system (LA/AIDS) of equations was used to test the hypothesis that devaluation results in a switch in expenditure from traded goods (imports and domestically manufactured goods) to non-traded goods. The results obtained from this analysis do not

---

[2] Estimated from this study

appear to support the hypothesis that currency devaluation has a significant price and income effect on private consumption of traded and non-traded goods. The elasticity estimates from the LA/AIDS model show that locally manufactured goods are substitutes for imported goods. However, the estimated cross price elasticities for non-traded goods with respect to the prices of traded goods are negative. This finding implies that both imports and locally manufactured goods are complements to non-traded goods, contrary to the widely held notion that these are substitutes. Since non-traded goods are predominantly raw agricultural products and manufactured and imported goods are mostly highly processed products, the complementary relationship between the two product categories is consistent with reality.

Although locally manufactured goods and imported goods are substitutes, the proportion of the latter in total private consumption (approximately 0.7 per cent) is so small that the impact of the substitution on external balance would be minimal. The bulk of Malawi's imports are goods for intermediate consumption such as fertilizer, pesticides and other industrial chemicals, oil, automotive and industrial products. Few, if any, of these products have close local substitutes. Thus, an increase in the import price after a devaluation does not seem able to induce significant substitutions that can contribute towards a restoration of balance of payments equilibrium.

5.9 Bibliography

Blanciforti, L., R. Green, and G. King. "U.S. Consumer Behavior over the Postwar Period: An Almost Ideal Demand System Analysis." *Giannini Foundation Monograph No 40.* University of California, Davis Aug. 1986.

Chen, Y. P. "An Analysis of Market Demand for Meats in Canada". Unpublished Ph.D Thesis. Edmonton: University of Alberta, 1991.

Deaton, A., and J. Muellbauer. *Economics and Consumer Behavior.* Cambridge: Cambridge University Press, 1989.

Delgado, C., and T. Reardon. "Policy Issues Raised by Changing Food Patterns in the Sahel." A Paper Presented at an IFPRI/ISRA Conference, Dakar, 1987.

Dutta-Roy, D. K., S. J. Mabey. *Household Budget Survey in Ghana.* Legon: University of Ghana, 1969.

Eales, J. S., and L. J. Unnevehr. "Demand for Beef and Chicken Products: Separability and Structural Change". *American Journal of Agricultural Economics* 70(1988):521-532.

Eicher, C. K., and D. C. Baker. "Trade, Marketing, Credit, and Consumption", in *A Survey of Agricultural Economics Literature*, eds. Martin, L. R., G. G. Judge, R. D. Day, S. R. Johnson, and G. C. Rausser. Minneapolis: Agricultural Economics Association, 1992.

Garcia, J. *The Effects of Exchange Rates and Commercial Policy on Agricultural Incentives in Columbia: 1953-1978".* Research report No 24. Washington, D.C.: International Food Research Institute, June 1981.

Gallant, A. R., and D. W. Jorgenson. Statistical Inference for a System of Simultaneous Equations, Non-Linear, Implicit Equations in the Context of Instrumental Variable Estimation". *Journal of Econometrics* 11(1979):275-302.

Gerrald, C. D. "Economic Development, Government Controlled Markets and External Trade in Food Grains: The Case of Four Countries in East Africa". Unpublished Ph.D Thesis. Minneapolis: University of Minnesota, 1981.

Goldman, S., and H. Uzawa. "A Note on Separability in Demand Analysis." *Econometrica* 32(1964):387-98.

Hassan, Z., and S. Johnson. *Consumer Demand for Major Foods in Canada*. Economics Branch Publication 76/2. Ottawa: Agriculture Canada, 1976.

Heyer, J. "Agricultural Economics and Peasant Farming in Kenya." Unpublished Ph.D Thesis. London: University of London, 1966.

Hicks, J. R. *A Revised Demand Theory*. Oxford: Oxford University Press, 1956.

Kapunda, S. M. "Consumption Patterns and Tanzania's Economic Development." Unpublished Ph.D Thesis. Dar es Salaam: University of Dar es Salaam, 1988.

Kennedy, E., and B. Cogill. *Income and National Effects of the Commercialization of Agriculture in South-Western Kenya*. IFPRI Research Report No 63. Washington D.C., 1987.

King, R. B., and D. Byerlee. "Factor Intensities and Locational Linkages of Rural Consumption Patterns in sierra Leone." *American Journal of Agricultural Economics* 60(1978):197-206.

Leurquin, P. P. *Le niveau de vie des populations du Ruanda-Urundi*. Paris: Editions Nauwelaerts, 1960.

Lizondo, S., and P. J. Montiel. "Contractionary Devaluation in Developing Countries: An Analytical Overview". *IMF Staff Papers* 36(1989):182-227.

Massell, B. F., and J. Heyer. "Household Expenditure in Nairobi: A Statistical Analysis of Consumer Behavior". *Econ. Dev. and Cultural Change* 17(1969):212-234.

_____ ., and A. Parnes. "Estimation of Expenditure Elasticities from a Sample of Rural Households in Uganda." *Oxford. Bull. Econ. and Stat* 31(1969):313-329

Mlambo, K. "Exchange Rate Overvaluation and Agricultural Performance in Zimbabwe: 1965 - 1985", in *Household and National Food Security in Southern Africa. Proceedings of the Fourth Annual Conference on Food Security research in Southern Africa*, October 31 - November 3, 1988. University of Zimbabwe/Michigan State University Food Security Research Project, Eds. G. Mudinu and R. Bernsten. Harare: Department of Agricultural Economics.

Odegaard, K. *Cash Crop Versus Food Crop Production in Tanzania: An Assessment of Major Post*

Colonial Trends. Economic Studies No 33. Lund: Lund University, 1985.

Ostby, I., and T. Gulilat. "A Statistical Study of Household Expenditure In Addis Ababa." *Eastern African Economic Review* 1(1969):63-74.

Oyejide, T. A. *The Effects of Trade and Exchange Rate Policies on Agriculture in Nigeria*. Research Report No 55. Washington, D.C.: International Food Policy Research Institute, June 1986.

Poleman, T. T. "The Food Economies of Urban Middle Africa: The Case of Ghana". *Food Research Institute Studies* 2(1961):121-174.

Pollack, R. A. Habit Formation and Dynamic Demand Functions. *Journal of Political Economy* 78(1970):745-763.

_____ , and T. Wales. Demographic Variables in Demand Analysis. Econometrica, 49(1981):1533-1551.

Quinn, V., M. Cohen, J. Mason, and N. K. Kgosidintsi. "Crisis-Proofing the Economy: The Response of Botswana to Economic Recession and Drought." In Cornia, Jolly, and Steward, 1988.

Salter, W. "Internal and External Balance: The Role of Price and Expenditure Effects." *Economic Record* 35(1959): 1-3.

Simmons, E. B. *Rural Household Expenditure in Three Villages of Zaria Province*. Samaru Miscellaneous Paper No 56. Zaria: Ahmadu Bello University, 1976.

Sjaastad, L. A. *Commercial Policy, True Tariffs and Relative Prices* (Mimeograph). Chicago: University of Chicago, Feb 1979.

Strauss, J. "Determinants of Household Food Consumption in Sierra Leone: Estimation of a Household-Firm Model with Application of the Quadratic Expenditure System." Unpublished Ph.D Thesis. East Lansing: Michigan State University, 1981.

Swan, T. "Longer-Run Problems of Balance of Payments", *In The Australian Economy: A Volume of Readings*, eds. H. Arndt and M. Corde. Melbourne: Cheshire Press, 1963.

Tshibaka, T. B. *The Effects of Trade and Exchange Rate Policies on Agriculture in Zaire*. Research

Report No 56. Washington, D.C.: International Food Policy Research Institute, 1986.

Varian, H. R. *Microeconomic Analysis*, Third Edition. New York: Norton and Company, Inc, 1992.

Chapter 6

Macroeconomic Effects of a Currency Devaluation in Malawi.

6.1 Introduction

The IMF and the World Bank-supported structural adjustment program in developing countries involves not only the use of currency devaluation as a mechanism for dealing with the problem of internal and external balance, but also some fiscal, monetary and commercial instruments. The most commonly applied measures include restraint on government expenditure, wages and growth in money supply, trade liberalization and an increase in taxation, domestic interest rates and producer prices. This suggests that the sector-specific approaches applied so far in this study are less likely to capture economy-wide effects of a devaluation and related macro policies. The purpose of this chapter is to analyze economy-wide effects of a devaluation using a macroeconomic model.

Studies by Silumbu(1992), Sahn, Arulpragasam and Merid (1990), and Mtawali (1993), suggest that Malawi's macroeconomic policies between 1981 and 1987 were both contractionary and expansionary. The fiscal policy adopted during this period aimed at rectifying the fiscal imbalance and creating a conducive environment for growth in the private sector. To this effect, Sahn et al observe that the average annual growth rate in government expenditure between 1978 and 1980 was 32 per cent; this slowed to an annual average increase of 12.2 per cent between 1981 and 1988.

According to Mtawali, Malawi's monetary reforms emphasized control and rationalization of credit, interest rates, and currency adjustments to ensure competitiveness in the international markets. However, the author also notes that these reforms were difficult to implement since the government resorted to domestic credit as means of financing its deficit. Combined borrowing by government and statutory bodies between 1980 and 1988 led to an increase in the growth of money supply, measured by cash and demand deposits, at an average of 20 per cent per year. This increase in money supply has been associated with high inflation rates; these reached an all time high of 25 per cent in 1987 (Sahn et al., and Mtawali).

Conceptually, contractionary fiscal and expansionary monetary policies have the potential of complementing or counteracting each other depending on the prevailing market conditions. Malawi's economy appears to have been relatively unprotected until the onset of severe balance of payments problems around 1978. In order to deal with the balance of payments problems and the fiscal imbalance generated by expansionist policies, the government resorted to protective trade practices including exchange rate rationing and higher tariffs. The average import tariff rose from approximately 20.4 per cent of imports in 1978 to 25.7 per cent in 1980 and to 38.4 per cent in 1986 (World Bank 1988). Price controls on most industrial goods and input subsidies were not removed until 1985. This was followed by the liberalization of the domestic market, especially grain, following the 1987 Agricultural Act. This act legally permitted private traders, for the first time, to compete with a long established parastatal marketing organization, Agricultural Development and Marketing Corporation (ADMARC). Maximum lending rates, which were being determined by the monetary authority, were also deregulated in 1987.

In view of extensive state intervention in both the goods and money market in the early 1980s, an increase in money supply through increases in domestic credit can generally be expected to result in high inflation rates and low real money balances. Under such conditions, the aggregate demand is expected to decline, reinforcing the negative effects of a contractionary fiscal policy.

Assuming prices were determined by market forces, the decline in interest rates that is often associated with an expansionary monetary policy would be expected to have a positive effect on private investment and aggregate demand, offsetting the negative effect of a contractionary fiscal policy. Alternatively, an increase in money supply, holding prices constant, is expected to result in an increase in the real money balances and private consumption increases, negating the effect of a contractionary fiscal policy. The effect of the policy mix can be expected to depend on the relative effects of individual policies.

6.2 Literature Review

In spite of increased interest in macroeconomic studies in the Sub-Saharan Africa, there appears

to be no consensus on the specification of analytical models. The lack of consensus, as Haque, Lahiri and Montiel (1990) observe, is manifested in the divergence of order and magnitude of certain key macroeconomic parameters such as the interest responsiveness of savings and investment, the offset coefficient for monetary policy, the relative price elasticity of exports and imports, and the importance of the "accelerator" mechanism in the determination of investment.

Khan (1990) presents a detailed discussion on some of the approaches that have been used to analyze macroeconomic effects of currency devaluation and related policies. One of the most popular approaches is the before-after approach originally used by Reichmann and Stillson (1978). This approach compares the behavior of balance of payments, inflation, and growth before and after implementation of a policy such as currency devaluation. Using non-parametric statistical tests, Reichmann and Stillson demonstrate that the IMF structural adjustment programs had no effect on target macroeconomic variables in 70 per cent of 79 Fund-supported programmes implemented between 1963 and 1972. This conclusion is also supported by Connor (1979) who used a similar approach. Although the "before-after approach is easy and seemingly objective, Khan observes that it is based on a strict assumption of "all other things being equal" and thus may not yield an estimate of the independent effect of programs on macroeconomic outcomes whenever the non-program determinants of these outcomes are changing between the pre-period and the program period. Khan further stresses that since the non-program determinants such as variations in the terms of trade, movements in the international interest rates, and domestic factors such as weather, change from year to year, the before-after estimates of program effects will typically be biassed. The approach will incorrectly attribute all changes in outcome between program periods to program factors.

In an attempt to overcome the weakness of the before-after approach, Donovan (1981, 1982) applies the "with-without" approach. This approach is based on the assumption that program and non-program countries face the same non-program determinants of macroeconomic outcomes. By comparing before-after changes in outcomes of program countries to those of non-program countries, the effects of non-program determinants should cancel out, leaving the differences in group performance as a reflection of the effects of the IMF-World Bank-supported program. Donovan's comparison of growth in oil and

non-oil developing countries were not definitive. Although a study by Gylfason (1987), employing similar statistical methodology, obtained results which appear to indicate that program countries' balance of payments performance was significantly better than that of the non-program countries. Khan argues that systematic differences between the two sets of countries prior to the program periods constitute a crucial factor in performance evaluation.

Macroeconomic effects of the IMF-Word Bank-supported programs have also been analyzed using "actual-versus-targets" approach. The success of a program is measured by the extent to which the macroeconomic indicators have attained their desired levels. Reichmann (1978), Beveridge and Kelly (1980), and Zulu and Nsouli (1985) are some of the authors who have used this approach or its variants to study economic effects of structural adjustment programs. Results obtained in these studies do not provide sufficient explanation of how a country is affected by a structural adjustment program. However, Khan observes that failing to reach desired targets is not necessarily synonymous with a program having no independent effects on outcomes. If targets are too ambitious, or if unexpected non-program factors intrude in a negative way, actual outcomes may fall short of targets even though the program may have produced a much better outcome than would occur in its absence or under alternative sets of policies (Khan).

Computable general equilibrium (CGE) models provide a more sophisticated framework for analyzing economy-wide effects of macroeconomic policies than alternative approaches. A detailed discussion of CGE models can be found in Pinstrup-Anderson (1990) and Sarris (1990). The conceptual basis of this approach is a schedule of expenditure transactions among production activities, factors of production, owners of factors (households and companies), and exogenous accounts (government, capital account, and the rest of the world) called the Social Accounting Matrix (SAM). The SAM is an extension of the more traditional inter-industry flow model that gives rise to the Leontief-type models. The elements that constitute the SAM show the amount of goods expended during a given period by the column category and received as income by the row category. The SAM is capable of capturing the interdependence of productive activities, returns to factors, and household income distribution.

A number of authors have used CGE models to analyze macroeconomic adjustments to various policies in developing countries. For example de Janvry and Subbarao (1986), and Dethier (1985) developed CGE models for India and Egypt, respectively, whereas Mateus (1986) developed a CGE model for Morocco. Devarajan, Lewis, and Robinson (1986), and Pinstrup-Andersen provide an extensive bibliography of CGE models applied to developing countries.

Although CGE models are now undoubtedly the best empirical tools with which to measure the impact of macroeconomic policies on households, Sarris observes that they require much effort and extensive resources to build and that they are data intensive. The author also contends that these models are complex and obscure, making simulated results difficult to trace or explain. In support of Sarris's contention, Pinstrup-Anderson argues that since many developing countries exhibit production dualism in which semi-subsistence and fully market-oriented farm households coexist, the problem of accounting for non-market activities in the semi-subsistence sector renders the CGE models less applicable to the economy-wide analyses of these countries.

The empirical methodology employed in this study is based on a simple macroeconomic Mundell-Flemming model developed for small open economies by Haque, Lahiri, and Montiel (1990). In Haque et al's framework, the economy produces only one good which is consumed both domestically and abroad. This study departs from that approach by introducing a two good model[1] as specified by Swan (1963), and Salter (1959).

6.3 Empirical Model

The Mundell-Flemming model begins with the definition of aggregate demand:

$$Y_t = C_t + I_t + G_t + X_t - \frac{e_t P_t^* M_t}{P_t}, \qquad (6.1)$$

where Y_t is the real gross domestic product (GDP); C_t is real private consumption expenditure, I_t is the real

[1] See Chapter 5 for a detailed discussion.

gross domestic investment expenditure; G_t is the real government expenditure on domestic goods; X_t represents real exports; e_t is the nominal exchange rate in terms of units of domestic currency per unit of foreign currency; M_t represents real imports; and P_t^* and P_t are prices in terms of foreign and domestic currencies, respectively.

Aggregate demand in the Swan-Salter two-good model is divided into traded and non-traded goods. The non-traded goods sector is composed of domestic consumption, C_N, investment, I_N, and government consumption G^N; i.e.,

$$Y_N = C_N + I_N + G_N \tag{6.2}$$

Consumption demand for non-traded goods may be specified as:

$$C_{N_t} = \alpha_1 + \alpha_2\left(\frac{P_{T_t}}{P_{N_t}}\right) + \alpha_3 Y_t^d + \upsilon_{ct} \tag{6.3}$$

where P_T is the price for tradable goods measured as a trade weighted sum of import and export prices; P_N is the price of non-tradable goods; Y_t^d represents real disposable income from the non-traded goods sector; and υ_{ct} is a random error term. According to Lizondo and Montiel (1989), the sign of the consumption function, and thus the effect of a devaluation, in a two-good model depends on whether traded goods have a higher share in consumption or in income. In order to illustrate this ambiguity the two authors define the general price level P as:

$$P = e^{\beta} P_N^{(1-\beta)} \tag{6.4}$$

where P_n is the price for non-traded goods; β is the share of traded goods in consumption; and real income Y is:

$$Y = Y_N e^{-\beta} + Y_T e^{(1-\beta)}, \tag{6.5}$$

where Y_T and Y_N represent traded and non-traded output, respectively. Differentiating Equation (6.5) with respect to e, holding Y_T and Y_N constant, yields:

$$\frac{\partial Y}{\partial e} = e^{-1}\,(\alpha - \beta)\left(Y_N e^{-\beta} + Y_T e^{(1-\beta)}\right) \gtrless 0 \qquad (6.6)$$

where α is the share of traded goods in total output. Equation (6.6) shows that the effect of a change in the exchange rate or a devaluation on total output or consumption depends on the proportions of traded and non-traded goods in the economy.

To analyze the relative price effect of a devaluation on consumption, equation (6.3) is differentiated with respect to the price ratio (P_T/P_N) which yields:

$$\frac{\partial C_{N_t}}{\partial P_N} = \left(\frac{1}{P_N}\,\frac{\partial C_{N_t}}{\partial P_{T_t}}\right) - \left(\frac{P_{T_t}}{P_N^2}\,\frac{\partial C_{N_t}}{\partial P_{N_t}}\right) \gtrless 0. \qquad (6.7)$$

Equation (6.7) can be transformed into elasticity form as:

$$\frac{\partial C_{N_t}}{\partial P_N}\,\frac{P_{N_t}}{C_{N_t}} = \left(\frac{1}{P_N}\,\frac{\partial C_{N_t}}{\partial P_{T_t}}\,\frac{P_{T_t}}{C_{N_t}}\right) - \left(\frac{P_{T_t}}{P_N^2}\,\frac{\partial C_{N_t}}{\partial P_{N_t}}\,\frac{P_{N_t}}{C_{N_t}}\right) \gtrless 0. \qquad (6.8)$$

The effect of a currency devaluation on the consumption of non-traded goods, as shown in equation (6.8), depends on the relative changes in the prices of traded and non-traded goods.

The effectiveness of macroeconomic policies that were instituted in early 1980s for the purpose of restoring internal and external balance partly depends on how much they influence consumer behavior. In order to account for these factors in the analysis, dummy variables are introduced in equation (6.3):

$$C_{N_t} = \alpha_1 + \alpha_2\left(\frac{P_{T_t}}{P_{N_t}}\right) + \alpha_3 Y^d_{N_t} + \alpha_4 LIB + \alpha_5 ADJ + \upsilon_{ct} \qquad (6.9)$$

where LIB is a partial liberalization dummy representing the subsidy removal programme and price deregulation in the industrial sector. The variable LIB takes the value of "one" from 1985, otherwise it is zero. ADJ is a dummy variable representing contractionary fiscal and expansionary monetary policies, and it assumes the value of "one" from 1981 onwards; otherwise it is zero.

Investment demand in Malawi's non-traded goods sector comprises mainly public investment which includes expenditure in the services sector, education, transportation and communication; and maintenance

of peace and security. Thus public investment is viewed as investment in the non-traded goods sector in this study. Following Heller (1975), the behavior of public investment is assumed to reflect the actions of a set of public decision makers (i.e., a Council of Ministers, etc,). The decision makers' utility is assumed to be a function of the difference between actual and targeted investment and output, and other national account determinants. The utility function is chosen to ensure diminishing marginal utility for each of the variables as they rise above a level determined jointly by the target and by the specific set of parameters for each variable.

In order to incorporate the adjustment process between actual and desired investment, a partial adjustment framework is introduced in the public investment model as follows:

$$I_{N_t} = \alpha_{6_0} + \alpha_7\left(Y_t - Y_t^e\right) + \alpha_8 I_{T_t} + \alpha_9 I_{N_{t-1}} + \upsilon_{I_t} \tag{6.10}$$

where υ_{I_t} is a random error term, α_7; and $\alpha_9 > 0$. The coefficient $\alpha_9 = (1 - \lambda)$, where λ is the partial adjustment parameter. When $\lambda = 1$ the changes in the current investment fully reflect the changes in the desired level of investment. If traded and non-traded investment are technologically complementary α_8 can be expected to have a positive sign. The influence of the partial liberalization and of fiscal and monetary policies on investment in the non-traded goods sector can be incorporated into equation (6.10) by introducing dummy variables:

$$I_{N_t} = \alpha_6 + \alpha_7\left(Y_t - Y_t^e\right) + \alpha_8 I_{T_t} + \alpha_9 I_{N_{t-1}} + \alpha_{10} LIB + \alpha_{11} ADJ + \upsilon_{I_t} \tag{6.11}$$

Government consumption is specified as a function of tax revenue. A partial adjustment framework is introduced by including lagged government consumption:

$$G_{N_t} = \lambda\alpha_{12} + \lambda\alpha_{13} TAX_t + \alpha_{14}(1-\lambda) G_{N_{t-1}} + \upsilon_{gt}\,, \tag{6.12}$$

where TAX_t represents tax revenue and υ_{gt} is a random error term. The partial adjustment framework in equation (6.12) is used to account for adjustment in current government consumption relative to desired or planned consumption levels.

Aggregate demand for traded goods is composed of domestic consumption, C_T, investment expenditure, I_T, exports X_t, and imports M_t:

$$Y_T = C_T + I_T + X_t - M_t , \tag{6.13}$$

the consumption function for traded goods is specified as in equation (6.9):

$$C_{T_t} = \beta_1 + \beta_2\left(\frac{P_{T_t}}{P_{N_t}}\right) + \beta_3 Y_t^d + \beta_4 LIB + \beta_5 ADJ + \varepsilon_{ct} \tag{6.14}$$

where ε_{ct} is a random error term. Since demand for imports is specified separately, equation (6.14) refers only to demand for manufactured goods.

Investment in Malawi's traded goods sector consists predominantly of private sector capital formation; hence, private investment is used as a proxy for investment in the traded goods sector. A neoclassical accelerator model developed by Jogernson (1967) has been widely applied in the analysis of private investment, see for example, Bischoff (1969, 1971) Hines and Catephoros (1970) Jorgenson (1967, 1971) and Clark (1979). In Jorgenson's framework, private investment is a decreasing function of the real interest rate. Although the accelerator model is a widely accepted general theory of investment, Greene and Villanueva observe that some of the inherent assumptions such as perfect capital markets and little or no government investment are inapplicable to developing country studies, and data for certain variables such as capital stock, real wages, and real financing rates for debt and equity are normally either unavailable or inadequate.

Another school of thought pioneered by Mckinnon (1973) and Shaw (1973) has recently advanced an alternative theory to explain the behavior of private investment in developing countries. According to Mckinnon and Shaw, private investment in developing countries is positively related to the accumulation of domestic real money balances. The major assumption underlying this hypothesis is that private investors in these countries must accumulate money balances before undertaking investment projects. Since real money balances are directly influenced by real deposits rates, there should be a positive relationship between private investment and real interest rates in these countries. As Greene and Villanueva observe,

this approach disregards the negative effect of higher real rates on investment via increases in the user cost of capital that normally follows from the neoclassical investment models. Several developing country studies including that of Green and Villanueva do not appear to support the Mckinnon-Shaw hypothesis.

Haque, Lahiri, and Montiel use a variant of the neoclassical accelerator model of investment to analyze the behavior of private investment in developing countries. In Haque et al's framework, private investment is specified as a function of real interest rate, real output, and the beginning-period capital stock. Other authors such as Sundararajan and Thukur (1980) deflate the real interest rate by the wage rate to capture the relative effect of user cost of capital on private investment. One of the factors considered in a number of studies as having an effect on private investment is public investment (a proxy for investment in the non-traded goods sector). As suggested by theory, public investment competes with private investment for scarce physical and financial resources and thus exerts a negative influence on the private investment, at least in the short term. However, public investment is also expected to complement private investment by creating infrastructure and raising the productivity of private capital stock, thereby reducing private investment requirements per unit of output.

Empirical evidence on the relationship between private and public investment is documented in Galbis (1979), Heller (1975), Tun Wai and Wong (1982), Sundararajan and Thakur, and Blejer and Khan (1984). In a study by Blejer and Khan on the behavior of private investment, a direct and statistically significant link between government policy variables and private capital formation was observed.

A major obstacle encountered in estimating neoclassical accelerator models in developing countries is the measurement of capital stock. As suggested by Blejer and Khan, it is assumed that capital stock is proportional to the expected output:

$$KP_t^* = \alpha YR_t^e, \tag{6.15}$$

where KP_t^* is the capital stock that the private sector wishes to have in place in future periods, and YR_t^e is the corresponding expected level of output. With this functional relationship and the need to account for policies associated with the structural adjustment program, private investment is respecified as:

$$I_{P_t} = \beta_6 + \beta_7 r_{w_t} + \beta_8 Y_t^e + \beta_9 I_{g_t} + \beta_{10} LIB + \beta_{11} ADJ + \epsilon_{I_t}, \qquad (6.16)$$

where r_{wt} represents the user cost of capital, (real interest rate deflated by the wage rate), I_{gt} is the level of public investment, and ϵ_{I_t} is a random error term.

Exports are specified as a function of the relative price between traded and non-traded goods, the level of real foreign income and technological change. Variants of this functional specification have been used by Goldenstein and Khan (1978), Bond (1987), Islam and Subramanian, and Bahman-Oskooee (1986). The closure of the Mozambique trade route is expected to have a negative effect on Malawi's exports. Removal of subsidies on inputs as well as implementation of contractionary fiscal and expansionary monetary policies are expected to have a negative influence on export performance through changes in the cost of production and the real exchange rate, respectively. Since Malawi's exports include tea, a perennial crop, a partial adjustment distributed lag model as described in Chapter 4 is used as a basis for estimating the relative price responsiveness of exports; the model is:

$$\begin{aligned} X_t = {} & \beta_{12} + \beta_{13} Y_t^* + \beta_{14} LIB + \beta_{15} ADJ + \beta_{16} PORT + \beta_{17} T + \alpha_0 \sum_{i=0}^{k} RER_{t-1} + \\ & \alpha_1 \sum_{i=0}^{k} i\ RER_{t-i} + \alpha_2 \sum_{i=0}^{k} i^2\ RER_{t-i} + \ldots\ldots \alpha_m \sum_{i=0}^{k} i^m\ RER_{t-i} + \epsilon_{xt}. \end{aligned} \qquad (6.17)$$

where T represents technological change and ϵ_{xt} is a random error term.

The import demand equation is specified as a function of the relative price between traded and non-traded goods, and real domestic income. The effects of the closure of the trade route though Mozambique, partial liberalization, contractionary fiscal and expansionary monetary policies are modelled by the inclusion of dummy variables. The model of imports is;

$$M_t = \beta_{18} + \beta_{19}\left(\frac{P_T}{P_N}\right)_t + \beta_{20}Y_t + \beta_{21}LIB + \beta_{22}ADJ + \beta_{23}PORT + \epsilon_{m_t}, \qquad (6.18)$$

where ϵ_{m_t} is a random error term.

The aggregate supply functions for the traded and non-traded goods sectors are based on the concepts of profit maximization and duality as discussed in Chapter 4. The aggregate supply of traded goods consists of exports and domestically manufactured goods, whereas the aggregate supply of non-traded goods consists of the difference between aggregate output and traded supply. The basic estimating equation for both traded and non-traded sectors is specified as a function of the relative price of traded to non-traded goods, the real wage rate, *w*, and the real interest rate, *r*. Dummy variables are introduced to reflect the effects of partial liberalization and contractionary fiscal and expansionary monetary policies. As in the case of exports, a partial adjustment distributed-lag model is used to account for adjustment lags in the supply of traded goods. Thus:

$$\begin{aligned} T_T = {} & \gamma_1 + \gamma_2 Y_t^* + \gamma_3 r_t + \gamma_4 w_t + \gamma_5 LIB + \gamma_6 ADJ + \gamma_7 PORT + \gamma_8 T + \\ & \alpha_0 \sum_{i=0}^{k} RER_{t-1} + \alpha_1 \sum_{i=0}^{k} i\ RER_{t-i} + \alpha_2 \sum_{i=0}^{k} i^2\ RER_{t-i} + \ldots\ldots \alpha_m \sum_{i=0}^{k} i^m\ RER_{t-i} + \epsilon_{yt}. \end{aligned} \qquad (6.19)$$

where T represents technological change and ϵ_{xt} is a random error term.

A simple linear relationship is used to estimate supply parameters in the non-traded goods model.

$$Y_{N_t} = \theta_1 + \theta_2 Y_t^* + \theta_3 r_t + \theta_4 w_t + \theta_5 LIB + \theta_6 ADJ + \nu_{s_t} \qquad (6.20)$$

where ν_{s_t} is a random error term.

The money market plays an important role in determining interest rates, prices, inflation and economic growth. Considering that money supply is an exogenous variable and also that Malawi's commercial interest rates were until 1988 regulated within a band of deposit rates set by the monetary

authority, this study focuses mainly on the demand for money as a major behavioral determinant of the money market.

Aggregate demand for real money balances has usually been specified as a function of the nominal interest rate and the level of income.

$$\frac{M_{o_t}}{P_t} = \varphi_1 + \varphi_2 i_t + \varphi_3 Y_t + \omega_t \qquad (6.21)$$

where M_{ot} presents nominal money balances, r_t is the nominal interest rate, $\varphi_2 < 0$, $\varphi_3 > 0$, and ω_t is the error term.

The partial liberalization policy is expected to have a negative effect on real money balances as prices and interest rates appreciate to reflect their opportunity costs. Assuming that adjustment in the demand for money follows a stock adjustment process, equation (6.21) can be respecified as:

$$\frac{M_{o_t}}{P_t} = \varphi_1 + \varphi_2 i_t + \varphi_3 Y_t + \varphi_4 LIB + \varphi_5 \frac{M_{o_{t-1}}}{P_{t-1}} + \omega_t \qquad (6.22)$$

where $\varphi_5 = (1 - \lambda)$, and λ represents the partial adjustment coefficient.

6.4 Data

The study is based on data for Malawi's annual accounts from 1965 to 1988. Major statistical series including gross national product, private and government expenditure, tax revenue, private and public investment, imports and exports, unit import and export price indices, wage rate, nominal money balances (M2), and population were obtained from the publication series of the Reserve Bank of Malawi, *The Financial and Economic Review*. The wage rate represents the annual monthly average of all industries. The gross domestic product deflator used as a proxy for the price of non-traded goods and Malawi's end-of-period discount rate were obtained from the IMF publication, *International Financial Statistical Yearbook*. The IMF *Statistical Yearbook* was also the main source for the world price series, the world

production index, the wholesale price index and the world consumer price index. The statistics for Malawi's main trading partners, the United Kingdom, the United States of America, U.S.A., Germany, Zimbabwe and Zambia, specifically the volume of trade, unit import price indices and exchange rates were obtained from the World Tables published by the World Bank. All the data except dummy variables and the time trend, *T*, (a proxy for technological change) were transformed into logarithms.

6.5 Empirical Estimation and Results

The aggregate income variable is specified as endogenous in the macroeconomic model. Since this variable would be correlated with the error terms of the equations in which it appears, instrumental variables were used in the estimation of consumption, investment and money demand functions. Seemingly unrelated regression (SUR) equation methods were also used in the estimation of traded and non-traded consumption equations. The SUR results were not significantly different from the two-stage least squares estimates and thus are not reported in the study. The instruments used in the estimation included as determinants of income, lagged disposable income, wages, interest rate, consumer price index, prices of traded and non-traded goods, and dummy variables representing fiscal and monetary policies. The export, import and the supply functions for trade and non traded goods were estimated using ordinary least squares with Cochrane-Orcutt transformations. This procedure was also used to estimate government consumption. Estimates of the respective equations are presented in Tables 6.1 to 6.6.

6.5.1 Consumption of Traded and Non-traded Goods

Most of the estimated parameters for the traded and non-traded consumption equations in Table 6.1 are significantly different from zero at the 95 per cent confidence level. A one per cent rise in the real exchange rate, which is equivalent to a one per cent real devaluation in the Malawi Kwacha, is associated with a 0.35 per cent decline and a 0.23 per cent increase in the consumption of traded and non-traded goods, respectively.

Table 6.1 Estimates of Private Consumption of Traded and Non-traded Goods

		Traded Goods		Non-Traded Goods	
Dep. Variable	**Ind. Variable**	**Estimate**	**S.E**	**Estimate**	**S.E**
Consumption	Constant	-1.923*	0.591	0.230	0.729
	RER	-0.350*	0.157	0.227*	0.114
	RGND	1.008*	0.274	0.845*	0.199
	LIB	0.318*	0.059	0.105*	0.042
	ADJ	0.150*	0.052	0.084*	0.037
	DW	2.308		2.276	
	Adj R^2	0.861		0.932	

RER = Real exchange rate expresses as a ratio of traded to non-traded goods prices;
RGND = Real disposable income;
LIB = Dummy for the partial liberalization policy; Lib = 1 from 1985 onwards, otherwise it is zero;
ADJ = Dummy for a combination of contractionary fiscal and expansionary monetary policy; ADJ = 1 from 1982 onwards, otherwise it is zero;
* = Significantly different from zero at 95 per cent confidence level; and
** = Significantly different from zero at 95 per cent confidence level.

The estimated income elasticity of demand for traded goods is 1.01, whereas that of the non-traded goods is 0.85. As observed in Chapter 5, most of the traded goods are less basic than the non-traded goods. Thus, estimates of unitary or greater income elasticities for traded goods, and less than unitary elasticity for non-traded goods are consistent with a priori expectations. Generally, the magnitude of these elasticity estimates are comparable to those obtained in a survey of commodity demand and supply elasticities by Bond (1987).

The partial commodity price deregulation, which affected all industrial goods except spare parts and fertilizers, appears to have a positive effect on the consumption of both traded and non-traded goods. This result is counter to a priori expectations, at least with respect to traded goods. One would have expected a decrease in the consumption of traded goods relative to non-traded goods with an increase in the price of the former, since deregulation makes the former more costly than the latter. A possible

explanation of this anomaly is that the number of people formally employed in the industrial sector, as observed by Sahn et al, increased from 60,400 to 101,480 between 1982 and 1986. The increase in the price of traded goods, holding the wage rate constant, reduces the real wage rate, and thus increases demand for labor. Although real consumer income is likely to have declined due to high inflation rates in this period, aggregate consumption of both traded and non-traded goods is likely to have increased because of an increase in the number of wage earners. The increase in consumption could also have been induced by a possible decline in prices of tradable goods resulting from a possible increase in supplies following the partial commodity price deregulation.

Results in Table 6.1 also indicate that the macroeconomic policy mix had a negative effect on the consumption of traded and non-traded goods. This observation implies that the effects of an increase in domestic credit, or an expansionary monetary policy, on aggregate demand, implemented between 1980 and 1987, offset the effects of a contractionary fiscal policy pursued by the Malawi government within the same period.

6.5.2 Traded and Non-traded Investment

The estimated coefficients for the traded and non-traded investment equations in Table 6.2 are all significantly different from zero at the 95 per cent confidence level. The estimates do not reject the hypothesis that private investment is negatively related to the real interest rate and positively related to expected output and levels of public investment. The observed relationship between the real interest rate and private investment is in contrast to the to the Mckinnon-Shaw hypothesis which postulates a positive relationship between the former and the latter.

The results also indicate that public investment adjusts to the targeted or desired level with a lag. The change in the current investment level reflects 65 per cent of the targeted or desired level of investment. The difference between actual and expected output appears to account for approximately 18 per cent of the public investment.

A combination of a contractionary fiscal policy and an expansionary monetary policy appears to

have a negative effect on levels of public investment. The effect of private investment on public investment appears to be positive, implying that the two forms of investment are technologically complementary.

Table 6.2 Estimates of Traded and Non-Traded Investment

	Traded Goods		Non-Traded Goods	
Variable	Estimate	S.E	Estimate	S.E
Constant	-2.825*	0.805	0.314*	0.054
R_{wt}	-0.722*	0.325	-	-
RGN_t^e	0.295*	0.069	-	-
DGN_t	-	-	0.187*	0.078
I_{t-1}	-	-	0.354*	0.069
I_{gt}	0.806	0.111	0.907*	0.024
I_{pt}	-	-	0.407*	0.099
ADJ	-	-	-0.158*	0.052
DW	2.035		2.184	
Adj R^2	0.805		0.842	

R_{wt} = User cost of capital, following Sundararajan and Thakur, is defined as real interest rate deflated by the wage rate, where real interest rate is defined as $R_t = \frac{1 + i_t}{1 + P_t/P_t}$ rather than the usual $R_t = i - P_t/P_t$;

RGN_t^e = Expected output;
DGN_t = The difference between actual and expected output;
I_{pt} = Private investment;
I_{t-1} = Lagged private investment; and
I_{gt} = Public investment.

6.5.3 Government Expenditure

All parameter estimates in the government consumption equation in Table 6.3 are significantly

different from zero at 95 per cent confidence level. The lagged government consumption estimate indicates that the adjustment in current government consumption represents approximately 42.6 per cent of the desired consumption levels. A 0.1 per cent rise in tax revenue is associated with a 0.42 per cent in government consumption.

Table 6.3 Estimates of Government Expenditure Function

	Non-Traded Goods	
Variable	**Estimate**	**S.E**
Constant	0.548	0.139
Tax	0.419	0.089
LGOV	0.574*	0.097
DW	2.147	
Adj R^2	0.995	

Tax = Tax revenue; and
LGOV = Lagged government consumption.

6.5.4 Exports and Imports

Table 6.4 presents estimates of Malawi's imports and exports. The estimated parameters in both models are significantly different from zero at the 95 per cent confidence level. The estimated distributed lag parameters indicate that the effect of the real exchange rate on the volume of exports is spread over a three year period. A one per cent increase in the exchange rate or a real devaluation of one per cent, is associated with approximately a 0.26 per cent rise in the current and the next two years. The real exchange rate effect declines slightly in the third year to 0.25 per cent.

The volume of Malawi's exports appears to be inelastic to changes in foreign income, which is proxied by the real world production index. A one per cent rise in foreign income is associated with approximately 0.31 per cent increase in the volume of exports. In view of the predominantly raw material nature of Malawi's exports, the inelastic supply responsiveness to changes in foreign income is not surprising and is consistent with the hypothesis of Prebisch (1959) which purports to link the balance of payments deficits of LDCs to a deterioration in the terms of trade, low foreign income elasticity of exports,

and the high income elasticity of imports of less developed countries from developed countries.

Table 6.4 Estimates of Export and Import Models

	Exports		Imports	
Variable	Estimate	S.E	Estimate	S.E
Constant	-4.297*	0.282	-1.193*	0.345
RER	0.261*	0.066	-0.697*	0.162
LRER1	0.258*	0.061	-	-
LRER2	0.255*	0.091	-	-
LRER3	0.253*	0.134	-	-
RGN	-	-	1.115*	0.129
RWP*	0.309*	0.100	-	-
LIB	-0.247*	0.073	-0.132*	0.053
ADJ	-0.171*	0.090	-0.292*	0.041
PORT	-0.171**	0.090	-0.115*	0.053
T	0.059*	0.022	-	
DW	2.260		2.288	
Adj R^2	0.980		0.802	

LRER1, LRER2, and LRER3 are first, second and third lags of the real exchange rate, respectively;
RWP* = World production index, a proxy for world income;
PORT = Dummy for the disturbances and closure of the Mozambique trade route; and
T = Time trend, a proxy for technical change.

The partial liberalization policy which included removal of input subsidies and partial deregulation of prices appears to have resulted in a 25 per cent decline in the volume of Malawi's exports. The closure of the Mozambique trade route and macroeconomic policies implemented in the early 1980s are also associated with approximately 17 per cent decline in the volume of exports. Although the technical change

coefficient, represented by a time trend variable *T*, is significantly different from zero, its magnitude is relatively small, suggesting that technology is not a major explanatory variable for Malawi's export performance.

Estimates of the import equation in table 6.4 are significantly different from zero and have the signs expected from theory. A one per cent rise in the real exchange rate is associated with approximately 0.70 per cent decline in the level of imports. The income elasticity of imports is almost unitary, lending support to the Prebisch hypothesis.

The closure of the traditional trade route and the partial liberalization policy, adopted in the early 1980s, appear to have resulted in a 12 per cent and 13 per cent decline in the volume of imports, respectively. The volume of imports also appears to have declined by 29 per cent following the implementation of the contractionary monetary and expansionary fiscal policies in the early 1980s. The negative effect of both the partial liberalization and the combined fiscal and monetary policies on Malawi's imports is likely attributable to a decline in purchasing power following the policy-induced rise in prices. A decline in import levels following closure of the Mozambique trade route is an expected outcome since re-routing Malawi's cargo through alternative routes translated into higher shipment costs.

The export supply and import demand elasticity estimates in Table 6.4 are generally comparable to those obtained in similar studies by Haque et al., and Bond. However, these estimates are slightly lower in magnitude that those obtained by Ghura and Greenes (1992) in their study of export performance involving 33 countries in the Sub-Saharan Africa. The two authors results suggest that a one per cent depreciation in the real exchange rate raises growth in total exports to GDP ratio and leads to an increase in the ratio of non-fuel primary products to GDP by 0.74 and 0.70 per cent, respectively. The differences between estimates in this thesis and those from Ghura and Greenes's study could be attributed to differences in the definition of the dependent variable and the methodology. However, in a number of studies cited by Bond, the export supply elasticities are inelastic, implying that countries which predominantly depend on raw or unprocessed products are unlikely to increase their export revenue through a reduction in commodity prices. Alternatively, a deterioration in the terms of trade is likely to exacerbate

the existing balance of payments problems in many developing countries including Malawi.

6.5.5 Supply of Traded and Non-traded Goods

Parameter estimates for the supply of traded and non-traded goods are presented in Table 6.5. All estimated parameters, except the trade route coefficient in the trade goods model and the macro policy coefficient in the non-traded goods model, are significantly different from zero at 95 per cent confidence level.

Table 6.5 Estimates of Traded and Non-traded Supply Functions

	Traded		Non-traded	
Variable	Estimate	S.E	Estimate	S.E
Constant	4.639*	0.336	5.250*	0.185
RER	0.408*	0.124	0.171*	0.071
LRER1	0.285*	0.082	-	-
LRER2	0.161*	0.043	-	-
LRER3	0.382**	0.023	-	-
LOW	-0.367*	0.109	-0.130*	0.069
R_t	-0.528*	0.107	-0.290*	0.100
LAB	-0.451*	0.127	0.131*	0.040
ADJ	-0.057*	0.029	-0.035	0.034
PORT	-0.066	0.044	-	-
T	0.142*	0.019	0.128*	0.006
DW	2.439		2.198	
Adj R^2	0.980		0.975	

R_t = Real interest rate; and
Low = Real wage rate.

The estimates of the distributed-lag model of supply of traded goods indicate that the effects of

an increase in the real exchange change last three years. However these estimates are slightly higher than the estimates in the export equation reported in Table 6.4. Since the aggregate supply function for traded goods includes domestically manufactured goods, higher estimates imply that a real devaluation stimulates import substitution in this sector. An increase in the real exchange rate by one per cent appears to result in a small but significant increase of 0.17 per cent in the supply of non-traded goods. In principle, since production of non-traded goods, mainly maize and other domestically consumed agricultural goods, does not involve the use of large quantities of imported or traded inputs, and due to the semi-subsistence nature of this sector, an increase in the real exchange rate is expected to have no significant effect on the supply of non-traded goods. However, an increase in the price of traded goods that is likely to follow an increase in the real exchange rate, is expected to exert an upward pressure on the price of non-traded goods, resulting in increased output in the non-traded goods sector.

The effect of increases in real wages and the real interest rate appears to be greater on the supply of traded goods than on the supply of non-traded goods. A one per increase in real wages is associated with a decline in the supply of the traded and non-traded goods by 0.37 per cent and 0.13 per cent, respectively. The relatively higher responsiveness of the traded goods supply to changes in the prices of both inputs appears to reflect the feature that the traded goods sector is more profit oriented than the non-traded goods sector.

Although the Malawi government influences the wage rate through minimum wage legislation the labor market can be considered as relatively competitive. Employers are free to hire or lay off workers. Malawi's labor market includes rural households that due to the small size of their holdings or the early depletion of their food stocks seek wage employment to support their families. More permanent employment in both the agricultural and industrial sectors is sought by the landless or near landless individuals.

Although there are limited survey data to serve as a source of comparison with the estimates derived from national accounts, Sahn et al suggest that wages offered by employers, particularly those in the estate sector, have fluctuated around the official agricultural wage. Since 1980, average estate workers'

wages have corresponded almost exactly to the minimum wage; these were higher than the legislated floor prior to that date. However, a large share of the estates, especially those of a small size, pay laborers less than the minimum wage (Sahn et al). These observations suggest forces of supply and demand exist in the labor market in spite of government intervention.

Generally, real wages have been declining throughout the 1980s. For example, the real agricultural wage of K9.54 per month in 1987 is lower than that of 1975 (K16.95 per month) and the peak level of 1982 (K17.92) (Sahn et al). The decline in the real wages and the industrial price deregulation in 1985 can probably explain the increase in the level of employment from 60,400 to 101,480 workers, and from 103,800 to 140,890 between 1982 and 1986 in the industrial and services sectors, respectively. However, employment levels in the agricultural sector actually decreased from 172,300 to 157,200 between 1983 and 1987, in spite of the decline in the real wages. The decline in real wages was probably not sufficient to offset the decline in the real producer prices resulting from rising inflation rates and fertilizer prices. Sahn et al observe that movements of real prices in the 1980s did not keep pace with inflation since 1982. By 1987, real producer prices of all the three crops fell to their 1980 levels (Sahn et al).

A one per cent increase in the real interest rate appears to result in the decline of traded and non-traded goods supplies by 0.53 per cent and 0.29 per cent respectively. The real interest rate is one of the major determinants of fertilizer quantities a farmer may purchase through commercial or semi-commercial credit. Fertilizer utilization in the smallholder sector is often limited by farmers' lack of accessibility to credit. However, since 1985, fertilizer up-take in the smallholder sector has risen by at an annual growth rate of 11 per cent, corresponding to an annual nutrient up-take of 12.89 per cent (Sahn et al). Although the increase in fertilizer uptake is attributed to several factors including an increase in supply through government purchases and foreign donations, an improvement in the smallholder access to credit and application of fertilizer to non-maize crops have been suggested by Sahn et al as some plausible explanations for the rise in the fertilizer utilization.

Both partial liberalization and macro economic policies appear to have a negative effect on the supply of traded goods. Price deregulation in the industrial sector and removal of input subsidies are

expected to lead to an increase in the cost of production and, depending on the difficulty of substitution between the more and less costly inputs, a decline in both the level of input utilization and traded output. An expansionary monetary policy is also likely to have a negative influence on output through its inflationary effect on the cost of production.

The effect of technological change on the supply of traded output is small but significantly different from zero. Malawi's production of export crops, the major portion of the traded goods sector, is labor intensive. With limited capital resource, increases in output appear to be associated with an increase in cropped land area and labor force.

The parameter estimates in this study have to be interpreted with care since the functional form used in the estimation assumes constant returns to scale and unitary elasticity of substitution between factors. In the absence of estimates of alternative functional forms, it is not possible to ascertain the suitability of the assumed Cobb-Douglas functional form to Malawi's production structure.

6.5.6 Money Market

Estimates of Malawi's demand for money are presented in Table 6.6. All the estimates are significantly different from zero at 95 per cent confidence level. An increase in the nominal interest rate by 0.1 per cent is associated with a decline in the real money balances by approximately 0.87 per cent. A one per cent rise in the level of income is associated with an increase in the demand for money by approximately 0.94. The partial liberalization and macro economic policies are both associated with a decline in the real money balances, by approximately 0.17 per cent, and 0.20 per cent, respectively. The inflationary pressure of the partial price deregulation and the expansionary monetary policy is likely to result in reduced real money balances.

The estimated interest rate effect on real money balances in this study is slightly greater than that obtained in a similar study, involving 31 developing countries, by Haque et al. However the income elasticity estimate is less than that of the latter. Khan (1980) observes that income elasticities of money demand substantially above unity are quite common in developing countries.

Table 6.6 Estimates of Demand for Money

Variable	Estimate	S.E
Constant	-3.187	0.342
i_t	-0.873	0.270
RGN	0.938	0.105
LIB	-0.165	0.090
ADJ	-0.201	0.089
DW	1.350	
Adj R^2	0.901	

i_t = Nominal interest rate.

6.6 Conclusion

This chapter examines the effects of currency devaluation, trade and macroeconomic policies on Malawi's traded and non-traded goods sectors between 1964 and 1987. In an attempt to analyze the effects of various macroeconomic policies on Malawi's economy, a two-sector Mundell-Fleming model was applied. The major macroeconomic variables analyzed included traded and non-traded private consumption, traded and non-traded investment (using private and public investment as proxies), levels of imports and exports, government consumption, supplies of traded and non-traded goods, and demand for real money balances.

Results obtained from the empirical analysis appear to support the hypothesis that consumption of traded goods and non-traded goods are negatively and positively related to the real exchange rate, respectively. However, estimated parameters in both the former and the latter are inelastic, indicating that a devaluation-induced rise in the relative price or real exchange rate is unlikely to induce a decline and an increase in the consumption of traded and non-traded goods, respectively, to levels that would significantly contribute to the restoration of internal and external balance. Since relative price estimates of both traded

and non-traded consumption functions are inelastic, expenditure switching between the two goods is unlikely. This observation complements the conclusion made in Chapter 5 that successive devaluations of the Malawi Kwacha doe not appear to have influenced Malawi's consumer behavior through the expenditure switching effect.

Both the partial liberalization policy (price deregulation and subsidy removal) and the combined contractionary and expansionary monetary policies appear to have a slightly larger positive impact on traded than non-traded goods, respectively. The increase in consumption for traded goods is probably due to an increase in the size of wage employment, and therefore income level, associated with a potential price deregulation-induced decline in real wages. The positive relationship between macroeconomic policy variables and both traded and non-traded goods is an indication that the effect of the expansionary monetary policy on aggregate demand had offsetting effects on the contractionary fiscal policy that was followed in the 1980s. Under such circumstances, it is unlikely that currency devaluation would have its intended effect on internal balance.

The estimates of Malawi's export supply and import demand functions are all inelastic. However, the former indicate that exports adjust to real exchange changes with a lag of up to three years. The response of Malawi's exports to changes in foreign income also appears to be inelastic.

Estimates of the relative price effects on the supply of traded goods, which comprises domestically manufactured goods, are similar in sign but slightly higher in magnitude than the estimates of the export supply function. Since the aggregate supply function for traded goods includes manufactured goods, the higher responsiveness suggests that an increase in the real exchange rate stimulates import substitution activity.

The estimated relative price effect on the supply of non-traded goods is positive, suggesting that the expected decline in the production of non-traded goods, due to the resource reallocation effect of a change in the real exchange rate, as suggested by the Swan-Salter model, did not take place. Several explanations can be advanced for this anomaly. One is that the non-traded sector is semi-detached from the market place where prices determine the opportunity cost of producing competing commodities.

Secondly, government intervention, through price control and subsidies, distorts price signals to the extent that production of commodities does not reflect the true opportunity cost; and thirdly, the policy of food self sufficiency makes maize, a major non-traded goods component and staple food in Malawi and neighboring countries, the highest priority crop, regardless of fluctuations in relative prices.

The effects of partial liberalization (price deregulation and removal of subsidies) on the supplies of traded and non-traded goods appear to be negative and positive, respectively. A decline in output supply is expected with an increase in the cost of production following and liberalization-induced rise in input prices. The production cost for non-traded goods is unlikely to be affected by the rise in the price of inputs since these use little or no traded inputs. Thus it is difficult to predict the effect of an increase in relative prices on the real exchange rate.

The combination of contractionary fiscal and expansionary monetary policies, and closure of the Mozambique trade route appear to have a negative effect only on traded goods. The negative relationship between the supply of traded output and the combined macroeconomic policy instruments can be associated to the latter's inflationary effects on input prices and cost of production.

The empirical estimates in this study do not reject the hypothesis that traded-investment, using private investment as a proxy, is negatively related to the real interest rate and positively related to expected output and levels of non-traded investment, using public investment as a proxy. The observed relationship between the real interest rate and private investment is in contrast to the to the Mckinnon-Shaw hypothesis which postulates a positive relationship between the former and the latter. The estimates also indicate that public investment adjusts to the targeted or desired level with a lag. The change in the current investment level reflects 65 per cent of the targeted or desired level of investment. The difference between actual and expected output appears to account for approximately 18 per cent of public investment. A combination of a contractionary fiscal policy and an expansionary monetary policy appears to have a negative effect on levels of public investment. The effect of private investment on public investment appears to be positive, implying that the two forms of investment are technologically complementary.

Government consumption appears to be mostly a function of tax revenue. However, the parameter

estimates indicate that the adjustment in the current government consumption represents approximately 42.6 per cent of the desired consumption levels.

Estimates of Malawi's demand for money are consistent with a priori expectations that real money balances are negatively related to nominal interest rate, but positively related to the level of income. Both the partial liberalization and macro policies are associated with a decline in the real money balances. The inflationary pressure of the partial price deregulation and the expansionary monetary policy is likely to result in reduced real money balances.

The estimated effect of chnages in interest rates on real money balances, from this study, is slightly greater than that obtained in a similar study, involving 31 developing countries, by Haque et al. The income elasticity estimate is less than that found by Khan (1980) observes that income elasticities of money demand substantially above unity are quite common in developing countries.

6.7 Bibliography

Bahmani-Oskooee, M. "Determinants of International Trade Flows: The Case of Developing Countries." *Journal of Development Economics* 20(1986):107-123.

Bischoff, C. W. " Hypothesis Testing and Demand for Capital Goods." *Review of Economics and Statistics* 51(1969):354-368.

Blejer, M., and M. S. Khan. "Government Policy and Private Investment in Developing Countries". *IMF Staff Papers* 31(1984):814 - 855.

Bond, M. E. "Primary Commodity Exports." *IMF Staff Papers* 34(1987):192 - 224.

Clark, P. K. "Investment in the 1970s. Theory, Performance and Prediction." *The Brookings Papers of Economic Activity* 1(1979):73-113.

Dethier, J. J. "The Political Economy of Food Prices in Egypt." Ph.D. Dissertation. Berkeley: Department of Agricultural and Resource Economics, University of California, 1985.

Devarajan, S., J. Lewis, and S. Robinson. *A Bibliography of Computable General Equilibrium (CGE) Models Applied to Developing Countries*. Working Paper No. 400. Berkeley: Division of Agriculture and Natural resources, University of California.

Galbis, V. "Money, Investment and Growth in Latin America, 1961 - 1973". *Economic Development and Cultural Change* 27(1979):423-43.

Goldstein, M., and M. S. Khan. "Income and Price Effects in Foreign Trade," in Jones, R. W., and P. B. Kenen, *Handbook of International Economics, Vil II*. Elservier Science Publishers, B.V., 1985.

Green, J., and D. Villanueva. "Private Investment in Developing Countries. An Empirical Analysis." *IMF Staff Papers* 38(1991):33-59.

Haque, N. U., K. Lahiri, and P. J. Montiel. "A Macroeconometric Model for Developing Countries." *IMF Staff Papers* 37(1990):537-557.

Heller, P. S. " A Model of Public Fiscal Behavior in Developing Countries: Aid, Investment, and Taxation." *American Economic Review* 65(1975):429 - 445.

Hines, A. G., and G. Catephoros. "Investment in U.K. Manufacturing Industry, 195667." in Hilton, K., and D. E. Heathfield, eds. *The Econometric Study of the United Kingdom: Proceedings*. London: Macmillan, 1970.

Islam, N., and A. Subramanian. "Agricultural Exports of Developing Countries: Estimates of Income and Price Elasticities of Demand and Supply."

de Janvry, A., and K. Subbarao. *Agricultural Price Policy and Income Distribution in India*. New Delhi: Oxford University Press, 1986.

Jorgenson, D. W. " The Theory of Investment Behavior." in Ferber, R, ed. *Determinants of Investment Behavior*, New York: National Bureau of Economic Research, 1967.

_____, "Econometric Studies of Investment Behavior: A Survey." Journal of Economic Literature 9(1971):1111-1147.

Khan, M. S. "Monetary Shocks and the Dynamics of Inflation." *IMF Staff Papers* 21(1980):250-84.

, "Macroeconomic Effects of Fund-Supported Adjustment Programs." *IMF Staff Papers* 37(1990):195-230.

Mateus, A. *A Multisector Model for Stabilization and structural Adjustment Policies: The Case of Morocco*. Washington D.C.: The World Bank, Mimeo, 1986.

Mckinnon, R. I. *Money and Capital in Economic Development*. Washington: Brookings Institution, 1973.

Mtawali, K. M. "Trade Price and Market Reform in Malawi." *Food Policy* 18(1993):300-307.

Pinstrup-Anderson, P. *Macroeconomic Policy Reforms, Poverty, and Nutrition: Analytical Methodologies*. Monograph 3. Ithaca: Cornell Food and Nutrition Policy Program, 1990.

Prebisch, R. "Commercial Policy in the Underdeveloped Countries." *American Economic Review, Papers and Proceedings* XLIX (1959):251-73.

, *Towards a New Trade Policy for Development*. New York: United Nations, 1964.

Sahn, D. E., J. Arulpragasam, and L. Merid. *Policy Reform and Poverty in Malawi*. Monograph 7. Cornell: Cornell Food and Nutrition Policy Program, 1990.

Sarris, A. *A Macro-Micro Framework for Analysis of the Impact of Structural Adjustment on the Poor in Sub-Saharan Africa.* Monograph 5. Ithaca: Cornell Food and Nutrition Policy Program, 1990.

Shaw, E. S. *Financial Deepening in Economic Development.* New York: Oxford University Press, 1973.

Silumbu, B. D. "The Role of the Exchange Rate and Monetary Policy in the Monetary Approach to the Balance of Payments: Evidence from Malawi". Paper Presented at the African Economic Research Consortium (AERC) Workshop, May 24 - 28, Nairobi, Kenya, 1992.

Sundararajan, V., and S. Thakur. "Public Investment, Crowding Out, and Growth: A Dynamic Model Applied to India and Korea." *IMF Staff Papers* 27(1980):814-855.

Tun, W. U., and C. Wong. "Determinants of Private Investment in Developing Countries." *Journal of Development Studies* 19(1982):19-36.

Part IV

The Monetary Approach to Malawi's Balance of Payments

Chapter 7

Application of the Monetary Model to Malawi's Balance of Payments Analysis

7.1 Introduction

It has long been the monetarist view that disequilibrium in the balance of payments is a direct result of a mismatch between demand and supply for money. The conceptual framework underlying the relevance of the monetary approach to the balance of payments, vis-a-vis currency devaluation, has been detailed in the introductory chapter. The monetary approach to the balance of payments postulates that a currency devaluation will improve the balance of payments unless it is accompanied by an approximately equiproportional increase in domestic credit (Connolly and Taylor 1976). In essence, assuming that domestic credit is held constant, or that changes in the money supply generated by movements in international reserves are not sterilized, an increase in the demand for money that follows a devaluation can only be satisfied through an increase in foreign exchange. The purpose of this chapter is to assess the applicability of the monetary model to the analysis of Malawi's balance of payments. This study is a follow up to Silumbu's (1992) work on the role of the exchange rate policy in the monetary approach to the balance of payments in Malawi. The results from Silumbu's study regarding the suitability of the monetary model to the analysis of Malawi's balance of payments were inconclusive.

7.2 Literature Review

Earlier attempts to apply the monetary approach to balance of payments to developing countries are documented in a survey by Kreinin and Officer (1978). Although a number of studies in Kreinin and Officer's survey appear unanimous with regard to the existence of a demand for money function as hypothesized by the monetary approach to the balance of payments, there is no consensus on the applicability of the monetary model to developing countries. Studies supporting and failing to support the approach appear evenly distributed in 37 developing country studies surveyed by the two authors.

The controversy regarding the estimates and their implications on the balance of payments can also be observed in the balance of payments studies by Kannan (1989) and Raghavan and Saggar (1989) for India. Raghavan and Saggar argue that key assumptions upon which the monetary model rests that excess demand for money causes an outflow of goods and services or sale of securities in the foreign market, leading to a reserve inflow until the BP deficit is eliminated, and also that an excess supply of money leads to imports of goods and services or a capital outflow until a BP surplus is eliminated, are unlikely to be satisfied in developing countries because of government intervention in both the goods and money market. The imposition of trade and non-trade barriers and strict control on capital movements distorts the free trade assumption inherent in the monetary model.

Differences in the estimation procedure appears to be one other source of controversy. As observed by Magee (1976), ordinary least squares (OLS) procedures used in many studies in estimating the balance of payments model are applicable if there is no sterilization of reserve changes and if real income, interest rates and prices are treated as exogenous, following the long-run full-employment paradigm. These assumptions imply that the demand for money is also exogenous and that the monetary authority has no control over any real or nominal variables in the economy except the domestic component of high powered money, through the balance of payments equation, and international reserves (Magee). If these assumptions are not satisfied, estimation of the balance of payments model using OLS leads to the problem of simultaneous equation bias.

7.3 Empirical Model

The empirical model used in a number of studies to test the applicability of the monetary approach to the balance of payments is specified as:

$$BP_t = \alpha_0 + \alpha_1 \Delta \log Y_t + \alpha_2 \Delta \log P_t + \alpha_3 \Delta \log i_t + \alpha_4 \Delta \log h_t + \alpha_5 \Delta \log d_t + e_t \qquad (7.1)$$

where:

$$BP_t = \frac{R_t}{R_t + D_t} \Delta \log R_t = \frac{\Delta R_t}{R_t + D_t}$$

$$d_t = \frac{D_t}{R_t + D_t} \Delta \log D_t = \frac{\Delta D_t}{R_t + D_t} ,$$

h_t defines the level of high-powered money composed of reserves and domestic credit, R_t and D_t respectively, Y_t is real income, i_t is the interest rate, P_t is the price level and e_t is a random error term.

Since the variables Y_t, P_t and i_t define the long term demand for money function, the associated parameters α_1, α_2, and α_3 are expected to be identical to their long term counterparts. As long as all the assumptions hold, Magee observes that parameter $\alpha_5 = -1$, suggesting that a K1.00 increase in the domestic credit, *ceteris paribus*, leads to a K1.00 decline in international reserves. However estimates of $|\alpha_5|$ which are significantly less than 1 imply misspecification, whereas estimates of $|\alpha_5|$ significantly greater than 1 imply sterilization. As discussed earlier, OLS estimates of the reserve flow model in equation (7.1) would be biassed if sterilization exists.

However, a test of whether $|\alpha_5|$ is significantly greater or less than 1 does not constitute a test for misspecification or sterilization. The standard approach often used to resolve this problem is to estimate the reserve flow equation simultaneously with a sterilization equation, representing the monetary authority's reaction function, viz:

$$D_t = \psi_0 + \psi_1 \Delta \log Y_t + \psi_2 \Delta \log P_t + \psi_3 \Delta \log i_t + \psi_4 \Delta \log h_t + \psi_5 T + \varphi_t \qquad (7.2)$$

where φ_t is the error term. Equations (7.1) and (7.2) can be estimated separately if sterilization does not exist. In order to check and confirm sterilization, several authors including Kannan, Raghavan and Saggar have used Granger's and Sims's causality tests. Granger's procedure consists of the following equations:

$$\Delta \log D_t = \beta_0 + \beta_1 \Delta \log D_{t-1} + \beta_2 \Delta \log R_t + \beta_3 \Delta \log R_{t-1} + \mu_t \quad (7.3)$$

$$\Delta \log R_t = \delta_0 + \delta_1 \Delta \log R_{t-1} + \delta_2 \Delta \log D_t + \delta_3 \Delta \log D_{t-1} + \varepsilon_t \quad (7.4)$$

The Sims's test is based on:

$$\Delta \log D_t = \theta_0 + \theta_1 \Delta \log R_{t-1} + \delta_2 \Delta \log R_t + \theta_3 \Delta \log R_{t+1} + \eta_t \quad (7.5)$$

$$\Delta \log R_t = \phi_0 + \phi_1 \Delta \log D_{t-1} + \phi_2 \Delta \log D_t + \phi_3 \Delta \log D_{t+1} + \nu_t \quad (7.6)$$

7.4 Data

The analysis is based on annual data from 1965 to 1988. Data on gross national product is used as a measured of national income, foreign reserves, and levels of nominal money balances (M2) were obtained from the *Financial Economic Review* of the Reserve Bank of Malawi. The end of period discount rate, which is used as the nominal rate of interest, was obtained from the International Monetary Fund, *International Financial Statistical Year Book*. The price variable is a weighted average of the price of non-traded goods (GDP deflator) and the price of traded goods (weighted average of import and export price indices).

7.5 Empirical Estimation and Results

The reserve flow and sterilization equations as specified in (7.1) and (7.2) were initially estimated using the ordinary least squares procedure (OLS). Although the estimated OLS coefficients in Table 7.1

have the expected theoretical signs, and are significantly different from zero at 95 per cent confidence level, the estimated absolute domestic credit coefficient, $|DC_t|$, is significantly greater than one suggesting the presence of sterilization, and raising the problem of simultaneity.

Table 7.1 Estimates of the Reserve Flow and Sterilization Models

	OLS Estimates				2SLS Estimates			
	Reserve Flow Model		Sterilization Model		Reserve Flow Model		Sterilization Model	
Variable	**Estimate**	**S.E**	**Estimate**	**S.E**	**Estimate**	**S.E**	**Estimate**	**S.E**
Constant	0.015*	0.085	0.328*	0.159	0.073*	0.034	0.095*	0.043
Di_t	-0.346*	0.140	-0.348*	0.120	-0.217*	0.085	-0.163*	0.077
DP_t	0.091*	0.030	0.095*	0.031	0.060*	0.018	0.042*	0.016
$DRGN_t$	0.299**	0.164	0.322*	0.148	0.173**	0.099	0.090	0.088
DH_t	-1.023*	0.143	-0.785*	0.133	-0.896*	0.090	-0.843*	0.079
DRH_t	-	-	-0.848*	0.041	-	-	-0.853*	0.026
DC_t	-1.135*	0.058	-	-	-1.184*	0.037	-	-
T	-	-	-0.015**	0.008	-	-	-0.002	0.003
DW	1.847		1.925		1.480		1.597	
Adj R^2	0.923		0.925		0.969		0.978	

$Di_t = \Delta \log i_t$, and where i_t is the nominal interest rate;
$DP_t = \Delta \log P_t$, $P_t = \alpha P_N + (1 - \alpha)P_T$, where P_N is the price index for non-traded goods, and P_T is the weighted average of the unit import and export prices;
$DRGN_t = \Delta \log Y_t$, and where Y_t is the real national income level;

$DH_t = \left(\frac{R_t}{R_t + D_t}\right) \Delta \log H_t$; , where H_t represents high-powered money composed of reserves and domestic credit, R_t, and D_t, respectively;

$DC_t = \left(\frac{D_t}{R_t + D_t}\right) \Delta \log D_t$; ;

T = Trend variable, Time;
* = Significantly different from zero at 95 per cent confidence level; and
** = Significantly different from zero at 90 per cent confidence level.

The two equations were thus re-estimated using the two stage least squares method.

Except for the real income and the trend variable in the sterilization model, the two stage least squares estimates are significantly different from zero and their signs are consistent with a priori expectations. However, the absolute value of the domestic credit estimate in the reserve flow model is significantly greater than one, while the reserve flow estimate, RH_t in the sterilization model is significantly less than one. The domestic credit coefficient, also known as "the offset coefficient", shows the degree to which changes in the domestic component of the monetary base are offset by changes in the international reserves, while the reserve flow coefficient, also known as "the sterilization coefficient" measures the use of monetary policy to sterilize the impact of reserve flows on the monetary base (Kannan). The expected value of the offset coefficient is -1 and the direction of causation is always from D_t to R_t. These a priori expectations imply that for a given level of money multiplier, changes in the domestic component of the monetary base, D_t, will cause an equal and opposite change in the international reserves, R_t. The monetary approach to the balance of payments assumes that there is no sterilization and therefore the value of the sterilization coefficient is expected to be zero. This coefficient is expected to be -1 under complete sterilization.

The results presented in Table 7.1 suggest that Malawi has been pursuing the policy of sterilization. But since the sterilization coefficient is less than 1, changes in Malawi's international reserves have not been completely sterilized by the domestic component of the monetary base. Although these two observations appear to violate the postulates of the monetary approach to the balance of payments, they do not form a basis for rejecting the applicability of the model. The presence of sterilization is tested using Granger's and Sims's causality test results are reported in Table 7.2. The causality tests were performed using both double log and log differenced models.

As indicated by the F-values in Table 7.2, the Granger causality test, using logs and log differences, suggests that there is a two-way causal relationship between domestic credit and international reserves, slightly stronger from the former to the latter than vice versa. The two way causal relationship is also evident in the double log Sims's test.

Table 7.2 Granger's and Sims's Causality Test

	Null Hypothesis	F-Value	
Granger's Test	R does not cause D	237.816*	5.646*
	D does not cause R	187.760*	5.888*
Sims's Test	D does not cause R	146.510*	4.218
	R does not cause D	246.589*	5.498*

R = Foreign exchange reserves; and
D = Domestic credit.

However, the log difference Sims's test appears to invalidate the Granger test. These results are contrary to the theoretical expectations that causality should run from domestic credit to foreign reserves and not vice versa. Causality tests in Silumbu's study on the role of exchange rate and monetary policy in the monetary approach to the balance of payments in Malawi were also not fully in support of the hypothesized relationship between the latter and the former. The contradiction in the tests suggests that the monetary approach to the balance of payments is of limited use to developing countries such as Malawi. Similar observations have been made by Raghavan and Saggar who used Indian data to test the hypothesis of sterilization.

Raghavan and Saggar argue that the greatest limitation of the monetary approach to the balance of payments, which is also acknowledged by its proponents, is that it ignores fiscal linkages to the money supply process. A case of India, cited by the two authors, which is similar to Malawi, is that the net Reserve Bank credit to the government is one of the principal sources of change in the high powered money, H_t.

The importance of the Reserve Bank credit, which represents government deficit, as an influencing factor in the monetary disequilibrium was tested and found to significant by Kannan. The author suggests that reduction of the Reserve Bank credit to the government would be one step towards addressing the

problem of balance of payments deficit.

7.6 Conclusion

The purpose of this chapter was to assess whether a disequilibrium in money market, as hypothesized by the monetary approach to the balance of payments, can be used to explain in the behavior of Malawi's balance of payments. Assessing the applicability of the monetary approach to Malawi's balance of payments in this study is important for three reasons. First, its provides an alternative framework for analyzing Malawi's balance of payments behavior to the elasticities approach and the absorption approach used in Parts II and III, respectively. Second, the Malawi government resorted to domestic borrowing in the late 1970s and throughout the 1980s as a means to finance its debt after alternative sources of financing had been exhausted. Since an increase in domestic credit affects the money market equilibrium, the usefulness of the monetary model to analyze the implications of such an increase is apparent. Third, Malawi's currency, the Kwacha, was successively in the 1980s as part of the IMF/World Bank-sponsored structural adjustment program, with the aim of restoring both external and internal balance. The theory of the monetary approach to the balance of payments hypothesizes that a currency devaluation will improve the balance of payments unless it is accompanied by an approximately equiproportional increase in the domestic credit.

In an attempt to test the stated hypothesis, reserve flow and sterilization equations for Malawi were estimated using both OLS and two stage least squares procedures. This was followed by sterilization tests using Granger's and Sims' causality tests. Although most of the estimated coefficients were consistent with a priori expectations, the estimated offset and sterilization coefficients indicated the presence of sterilization, albeit less than complete. The results of Granger's and Sims's causality test appear to indicate the presence of a two way causal relationship between domestic credit and foreign exchange reserves, not just from credit to reserves as stipulated by the monetary model. The indication that Malawi actively pursues a sterilization policy, and the apparent existence of a two-way causation other than one-way, as hypothesized in the monetary model, implies that this approach may not be an appropriate framework for

analyzing the behavior of Malawi's balance of payments.

7.7 Bibliography

Connolly, M. and D. Taylor. "Testing the Monetary Approach to Devaluation in Developing Countries". *Journal of Political Economy*, 84(1976):849-859.

Kannan, R. "Monetary Approach to Balance of Payments: A Case of India, 1968 - 85." *Economic and Political Weekly*, 24(1989):627-636.

Kreinin, M., and E. L. H. Officer. *The Monetary Approach to the Balance of Payments: A Survey*. Princeton, N.J: Princeton University, 1978.

Magee, S. P. "The Evidence of the Monetary Model to the Balance of Payments and Exchange Rate". *American Economic Review*, 66(1976):163-170.

Raghavan, V. S., and M. K. Saggar. "Applicability of the Monetary Approach to the Balance of Payments". *Economic and Political Weekly*, 24(1989):1855-1859.

Silumbu, B. D. "The Role of the Exchange Rate and Monetary Policy in the Monetary Approach to the Balance of Payments: Evidence from Malawi". Paper Presented at the African Economic Research Consortium (AERC) Workshop, May 24 - 28, Nairobi, Kenya, 1992.

Part V

General Conclusion

Chapter 8

General Conclusion and Policy Implications

8.1 Overview

Malawi's rapid export-led economic growth, estimated at 6.1 per cent[1] per annum in real GDP, was abruptly curtailed in 1979 due to a number of external and internal factors. According to Kydd and Hewitt (1986), rising interest rates and oil prices, reduced external demand, the deteriorating terms of trade, and closure of the Mozambique trade rooted are among the major contributory external factors to Malawi's economic crisis. The impacts of these shocks were exacerbated by poor rainfall in certain parts of the country, particularly in the 1979/80 growing season, resulting in reduced agricultural output. Although these factors are important in analyzing Malawi's economic performance, the IMF, the World Bank and several scholars attribute the decline in growth in several African countries, including Malawi, to inappropriate domestic policies, particularly expansive demand policies as characterized by four factors: government spending far in excess of revenue, leading to budget deficits and inflation; failure to adjust exchange rates to reflect internal inflation, leading to over valued currencies; failure to maintain a balance between imports and exports in the face of rising prices of imported goods; and insufficient attention paid to policies that encourage expansion of aggregate supply.

The economic crisis in 1979 and throughout the 1980s unveiled Malawi's deep routed structural problems which required more than the traditional economic policies that had followed since the country attained its independence in 1964. The introduction of structural adjustment program, SAP, and structural adjustment loan, SAL, by the IMF and the World Bank in 1981 was in response to the uncovered structural weaknesses. The SAP was designed to accomplish the following two objectives: to facilitate the expansion and balanced growth of international trade, and to contribute, thereby, to the promotion and maintenance

---

[1](Office of the President and Cabinet 1987)

of high levels of employment and real incomes, and to the development of productive resources of all members as the primary objective of economic policy[2]; and to shorten the duration and lessen the degree of disequilibrium in the international balance of payments[3].

Central to the IMF-supported adjustment programme was the reduction in aggregate demand to the level commensurate with the country's productive capacity. Among the SAL conditions, currency devaluation was and still is considered the most effective instrument, not only for reducing aggregate demand, but also for improving external competitiveness through changes in the relative prices between the traded and non-traded goods sectors. The exchange rate policy, together with certain fiscal and monetary restraint measures, constituted the bulk of the conditions upon which the initial (1981) and subsequent World Bank SAPs were negotiated and implemented.

While the effectiveness of the exchange rate policy in altering the balance of payments is well recognized, economists still disagree on the direction and magnitude of its impact on the agricultural sector as well as on the economy as a whole. This area of research has not received much attention in Malawi and other African countries even though exchange rate policy has been viewed by international financial authorities as a major instrument for structural adjustment in these nations. Since 1981 Malawi has negotiated four Structural Adjustment Loans (SAL) with the World Bank, followed by successive devaluations of its currency, the Kwacha. Almost a decade after the first SAP was implemented in Malawi, there are no visible or significant results relative to the magnitude of currency devaluation (97 per cent [4]) to suggest that the objective espoused in the SAL agreement have been achieved. Following the introduction of the SAP, there has been no discernible pattern of improvement in the export sector, of which agriculture contributes nearly 90 per cent. Both the trade balance and the overall balance as a ratio of GDP remain negative. The apparent ineffectiveness of the exchange rate policy in improving the

---

[2]International Monetary Fund (IMF) *Articles of Agreement*. Article 1, Sec ii.

[3]Ibid., Article 1, Sec vi.

[4]Estimated from the International Monetary Fund (IMF) Annual Reports, *Exchange Arrangements and Exchange Restrictions*, 1983-1989.

competitiveness of the export sector and the current luck of empirical studies evaluating such policies, in Malawi and other countries of the Sub-Saharan Africa, prompted this study. Thus, the study sought to analyze the impact of currency devaluation and related macroeconomic policies on Malawi's trade balance, balance of payments, and overall economy.

In an attempt to analyze the effects of successive currency devaluations and various macroeconomic policies on Malawi's economy, three approaches to the balance of payments analysis were employed in the study. These included the elasticities approach, the absorption approach and the monetary approach. The major hypothesis advanced in the study is that currency devaluation leads to an improvement in the trade balance and balance of payments. From each of the three theoretical models, testable hypotheses in support of the major hypothesis were formulated. The null hypotheses in the elasticities approach were as follows; (a) that currency devaluation leads to an increase in the real exchange rate; (b) that Malawi's trade balance will respond positively to a currency devaluation; (c) that the apparent failure to observe an immediate improvement in the trade balance in Malawi is associated with the J-Curve effect; and (d), that exchange rate and price transmission elasticities are not significantly different from one. The null hypothesis associated with the absorption approach was that currency devaluation improves the balance of payments due to; (a) the expenditure switching effect, and (b) a relative decline and increase in the consumption of traded and non-traded goods, respectively. Using the assumptions of purchasing power parity, perfect capital mobility and perfect arbitrage, the monetary model predicts that a nominal devaluation will have a one to one effect on domestic prices. Under these circumstances, the testable hypothesis in the monetary approach was that a devaluation will generate an increase in the demand for money which will in turn lead to a temporary improvement in the balance of payments, as long as domestic credit is kept constant

Although the three approaches to balance of payments analysis have different assumptions they are all based on a common theoretical relationship between nominal and real exchange rates; that is, currency devaluation will not lead to an improvement in balance of payments unless the associated increase in the nominal exchange rate (units of domestic currency per unit of foreign currency), leads to an increase

in the real exchange rate.

8.2 Empirical Results

A partial equilibrium model was used as the main framework for testing the hypotheses related to the elasticities approach to balance of payments, whereas a two good general equilibrium model, developed by Swan and Salter, was used in testing the hypotheses in the absorption approach. The following section presents the main findings of the empirical estimations.

8.2.1 Malawi's Exchange Rate Determination

The effects of currency devaluation and other factors on Malawi's real exchange rate were examined using maximum likelihood econometric procedures. Empirical estimates from the analysis suggest that successive nominal devaluations have a small but positive effect on Malawi's effective real exchange rate in both the short-run and long-run. The effective real exchange rate appears to adjust to the desired or equilibrium real exchange level with a one year lag. However, a substantial portion of the adjustment appears to take place within the current year. The results also suggest that quantitative restrictions exert the greatest negative effect on the real exchange rate followed by the terms of trade, domestic credit and capital flows.

The implication of these findings is that for a nominal devaluation to lead to a real depreciation in the effective real exchange rate, quantitative restrictions should be eliminated and domestic credit controlled. The control of domestic credit requires a reduction in public expenditure and/or a restriction in the growth of money supply. The findings in this study are consistent with observations made by Edwards (1989) that if nominal exchange rate change is accompanied by expansive domestic credit policies, the corrective effect of a devaluation on the real exchange rate will be greatly diminished.

8.2.2 Price and Exchange Rate Transmission

For the real exchange rate to influence producers' and consumers' decision making, signals of

price incentives must be transmitted throughout the economy. A unitary elasticity of price transmission or pass-through implies that changes in the exchange rate and foreign prices are completely transmitted to the domestic economy, whereas a less than unitary elasticity implies a less than perfect transmission. Based on the preceding propositions, the extent to which changes in the effective exchange rate and the foreign currency denominated import price are transmitted to Malawi's import price in Malawi was estimated to determine whether information generated by a currency devaluation moves in the fashion postulated by trade theory. In addition, the effects of a partial market liberalization and the disturbance and closure of Malawi's major trade route on the import price were analyzed. The estimated coefficients strongly support the hypothesis that changes in the real exchange rate are fully transmitted to the real domestic price of imports in both the short-run and long-run. However, the results appear to reject the hypothesis that changes in the real foreign denominated import prices are fully transmitted to domestic import prices over the same period.

The partial market liberalization policy implemented as part of the IMF structural adjustment programme appears to have had a significant downward effect on the real price of Malawi's imports. A partial price deregulation and the subsidy removal program that were instituted in 1985 are likely to have created a favorable environment for competition and increased efficiency in resource allocation. The downward pressure on the aggregate import price is likely to have been generated by increased availability of goods and services.

The disturbances and closure of the Mozambique trade route appear to have had a significant inflationary effect on the real price of imports. The increase in the price of imports associated with the closure of the trade route is estimated at 14 per cent in the short run and 24 per cent in the long run. The role of currency devaluation is to improve the trade balance through the differential effect on the volume of imports and exports. If the change in the real exchange rate is fully transmitted to domestic import prices as indicated by the results in this study, then the apparent failure of the exchange rate policies to improve trade balance in the Sub-Saharan Africa should be attributed to other factors and not inflexibility in the price of imports. Trade balance can only improve if policy targets the factors that inhibit rapid

adjustment to relative price changes.

8.2.3 The Effect of Currency Devaluation on Malawi's Trade Balance

The hypothesis that currency devaluations lead to an improvement in trade balance through changes in the real exchange rate was tested using static and distributed-lag models. Dynamic models indicate the existence of a lagged adjustment. A one percent change in the real exchange rate appears to be associated with a 0.90 per cent rise in the trade balance three years after the devaluation. Since the lagged trade balance responsiveness to a change in the real exchange rate does not sufficiently offset the decline in the first two years, the full effect of the hypothesized J-Curve effect does not apply.

The analysis suggests that a one percent rise in real domestic income would result in 30 to 50 percent reduction in the trade balance whereas changes in real foreign income do not appear to have any discernible effect on trade balance. The unresponsiveness of the trade balance to changes in foreign income may be attributable in part to the unmanufactured nature of Malawi's export commodities and also to the development of unfavorable market conditions in the major importing western countries. Tobacco, in particular, is a major source of export earnings and this commodity faces market problems in the west since it is classified as a health hazard. Sugar, another export, faces limited and distorted world markets. The effectiveness of the exchange rate policy appears to have been partly limited by the disturbance and eventual closure of the Mozambique port, a feature that highlights the difficulty for domestic policy of dealing with external factors and disturbances.

Evidently, an extended mix of domestic and external policy changes may be necessary to achieve the desired improvements in trade balance. Proposals have included regional integration (Koester 1993), further domestic market liberalization (Valdes 1993) and the need for more open importing policies in developed country markets.

8.2.4 Expenditure Switching Effect of a Currency Devaluation on the Consumption of Traded and Non-traded Goods

The hypothesis that currency devaluation has an expenditure switching effect on the consumption of traded and non-traded goods was tested using an almost ideal demand system (LAIDS) of equations. Traded goods included the domestically manufactured items and imports for final consumption. The difference between the value of total private consumption and traded goods constituted the value of non-traded goods. Seemingly unrelated regression equation parameter estimates from the empirical analysis do not appear to support the hypothesis that currency devaluation has a significant price and income effect on the consumption of traded and non-traded goods. The elasticity estimates from the LAIDS model show that locally manufactured goods are substitutes for imported goods. However, the estimated cross-price elasticities for non-traded goods with respect to prices of traded goods are negative. This finding implies that both imports and domestically manufactured goods are complements to non-traded goods, contrary to the widely held notion that these are substitutes. Since non-traded goods are predominantly raw agricultural products, and manufactured and imported goods are mostly highly processed products, the complementary relationship between the two product categories is consistent with reality.

Although locally manufactured goods and imported goods are substitutes, the proportion of the latter (0.7 per cent) is so small that the impact of the substitution on external balance would be minimal. The bulk of Malawi's imports are goods for intermediate consumption such as fertilizer, pesticides and other chemicals, oil, automotive and industrial products. Few, if any, of these products have close local substitutes. Thus, an increase in the import price after a devaluation does not seem able to induce any significant substitutions that can contribute towards a restoration of balance of payments equilibrium.

8.2.5 Currency Devaluation and Related Macroeconomic Policies

A two-sector Mundell-Fleming model was used to analyze the effects of various macroeconomic policies on Malawi's economy. The major macroeconomic variables analyzed included traded and non-traded private consumption, traded and non-traded investment (using private and public investment as

proxies), levels of imports and exports, government consumption, supplies of traded and non-traded goods, and demand for real money balances.

The results from this empirical analysis appear to support the hypothesis that consumption of traded goods and non-traded goods are negatively and positively related to the real exchange rate, respectively. However, estimated parameters in both the former and the latter are inelastic, indicating that a devaluation-induced rise in the relative price or real exchange rate is unlikely to induce a decline and an increase in the consumption of traded and non-traded goods, respectively, to levels that would significantly contribute to the restoration of internal and external balance. Since relative price estimates of both traded and non-traded consumption functions are inelastic, expenditure switching between the two goods is unlikely. This observation complements the conclusion made in Chapter 5 that successive devaluations of the Malawi Kwacha does not appear to have influenced Malawi's consumer behavior through the expenditure switching effect.

Both the partial liberalization policy (price deregulation and subsidy removal) and the combined contractionary and expansionary monetary policies appear to have a slightly larger positive impact on traded than non-traded goods, respectively. The increase in consumption for traded goods is probably due to an increase in the size of wage employment, and therefore income level, associated with a potential price deregulation-induced decline in real wages. The positive relationship between macroeconomic policy variables and both traded and non-traded goods is an indication that the effect of the expansionary monetary policy on aggregate demand had offsetting effects on contractionary fiscal policy followed in the 1980s. Under such circumstances, it is unlikely that currency devaluation would have its intended effect on internal balance.

The estimates of Malawi's export supply and import demand functions are all inelastic. However, the former indicate that exports adjust to real exchange changes with a lag of up to three years. The response of Malawi's exports to changes in foreign income also appears to be inelastic.

Estimates of the relative price effects on the supply of traded goods, which comprises domestically manufactured goods, are similar in sign but slightly higher in magnitude than the estimates of the export

supply function. Since the aggregate supply function for traded goods includes manufactured goods, the higher responsiveness suggests that an increase in the real exchange rate stimulates import substitution activity.

The estimated relative price effect on the supply of non-traded goods is positive, suggesting that the expected decline in the production of non-traded goods, due to the resource reallocation effect of a change in the real exchange rate, as suggested by the Swan-Salter model, did not take place. Several explanations can be advanced for this anomaly. One is that the non-traded sector is semi-detached from the market place where prices determine the opportunity cost of producing competing commodities. Secondly, government intervention, through price control and subsidies, distorts price signals to the extent that production of commodities does not reflect the true opportunity cost; and thirdly, the policy of food self sufficiency makes maize, a major non-traded goods component and staple food in Malawi and neighboring countries, the highest priority crop, regardless of fluctuations in relative prices.

The effects of partial liberalization (price deregulation and removal of subsidies) on the supplies of traded and non-traded goods appear to be negative and positive, respectively. A decline in output supply is expected with an increase in the cost of production following liberalization-induced rise in input prices. The production cost for non-traded goods is unlikely to be affected by the rise in the price of inputs since it uses little or no traded inputs, and thus it is unlikely to predict with certainty the effect of an increase in relative prices or the real exchange rate.

The combination of contractionary fiscal and expansionary monetary policies, and closure of the Mozambique trade route appear to have a negative effect only on traded goods. The negative relationship between the supply of traded output and the combined macroeconomic policy instruments can be associated to the latter's inflationary effects on input prices and cost of production.

The empirical estimates in this study do not reject the hypothesis that investment in the traded goods sector, using private investment as a proxy, is negatively related to the real interest rate and positively related to expected output and levels investment in the non-traded goods sector, using public investment as a proxy. The observed relationship between the real interest rate and private investment is

in contrast to the hypothesis of Mckinnon (1973) and Shaw (1973) which postulates a positive relationship between the former and the latter. The estimates also indicate that public investment adjusts to the targeted or desired level with a lag. The change in the current investment level reflects 65 per cent of the targeted or desired level of investment. The difference between actual and expected output appears to account for approximately 18 per cent of the public investment within one year. A combination of a contractionary fiscal policy and an expansionary monetary policy appears to have a negative effect on levels of public investment. The effect of private investment on public investment appears to be positive, implying that the two forms of investment are technologically complementary.

Government consumption appears to be mostly a function of tax revenue. However, the parameter estimates indicate that the adjustment in government consumption in a year represents approximately 42.6 per cent of the desired consumption levels.

Estimates of Malawi's demand for money are consistent with a priori expectations that real money balance are negatively related to nominal interest rate, but positively related to the level of income. Both the partial liberalization and macro policies are associated with a decline in the real money balances. The inflationary pressure of the partial price deregulation and expansionary monetary policy is likely to result in reduced real money balances.

The estimated interest rate effect on real money balances in this study is slightly greater than that suggested in a similar study, involving 31 developing countries, by Haque, Lahiri, and Montiel (1990). However the income elasticity estimate is less than the range of the latter. Khan (1980) observes that income elasticities of money demand substantially above unity are quite common in developing countries.

8.5.6 The Monetary Approach to Malawi's Balance of Payments

The monetary approach to the balance of payments suggests that a disequilibrium in money market can be used to explain the behavior of Malawi's balance of payments. Assessing the applicability of the monetary approach to Malawi's balance of payments in this study is important for three reasons. First, it provides an alternative framework for analyzing Malawi's balance of payments behavior to the elasticities

approach and the absorption approach used in Parts II and III, respectively. Second, the Malawi government resorted to domestic borrowing in the late 1970s and throughout the 1980s as a means to finance its debt after alternative sources of financing had been exhausted. Since an increase in the domestic credit affects the money market equilibrium, the use of the monetary model to analyze the implications of such an increase is apparent. Third, Malawi's currency, the Kwacha, was successively devalued in the 1980s as part of the IMF/World Bank-sponsored structural adjustment program, with the aim of restoring both external and internal balance. The theory of the monetary approach to the balance of payments hypothesizes that a currency devaluation will improve the balance of payments unless it is accompanied by an approximately equiproportional increase in the domestic credit.

In order to test the stated hypothesis, reserve flow and sterilization equations for Malawi were estimated using both OLS and two stage least squares procedures. This was followed by sterilization tests using Granger's and Sims' causality tests. Although most of the estimated coefficients were consistent with a priori expectations, the estimated offset and sterilization coefficients indicated the presence of sterilization, albeit less than complete. Granger's and Sims's causality tests appear to indicate the presence of a two way causal relationship between domestic credit and foreign exchange reserves, not just from credit to reserves as stipulated by the monetary model. The indication that Malawi actively pursues a sterilization policy and the apparent existence of two-way causation other than one-way, as hypothesized in the monetary model, implies that the monetary approach may not be an appropriate framework for analyzing the behavior of Malawi's balance of payments.

8.6 Policy Implications of the Research Findings

Trade theory suggests that the effectiveness of the exchange rate policy, particularly devaluation of currency, in contributing to the restoration of internal and external balance is predicated on the change in the real exchange rate and the absence of price and non-price distortions in the economy. Results reported in Chapters 2 and 3 indicate that a nominal devaluation, at least in Malawi, generates a small but positive increase in the real exchange rate, and that changes in the nominal exchange rate are fully reflected

in the price of imports in both the short run and long run. However, the results also indicate that quantitative restrictions exert the greatest negative influence on the real exchange rate, stifling the desired effects of a currency devaluation. To a less extent, the terms of trade balance, domestic credit, and capital flows also appear to have a negative effect on the real exchange rate. Thus, the apparent failure of successive devaluations to lead to an improvement in Malawi's trade, as results in Chapter 4 indicate, does not necessarily imply impotence on the part of the exchange rate policy; but rather, that the potential for a devaluation to generate a relative increase in the real exchange rate is undermined by extensive government interventions through price and non-price mechanisms. Since quantitative restrictions in Malawi appear to have been imposed to deal with lack of foreign exchange, and as a means to generate government revenue, contractionary fiscal policy, though restraint on government expenditure and domestic borrowing, would provide a mechanism for reducing aggregate demand to sustainable levels.

Although the results in Chapter 4 and 6 suggest the presence of a lagged relationship between traded goods and the real exchange rate, the estimated responsiveness appear inelastic. With low estimates of export elasticities to relative price and foreign income changes, dependency on bulky raw agricultural products, as a strategy for growth and development, needs to be re-examined. Export-led growth paints an even bleaker picture for countries, such as Malawi, which depend on tobacco as the major source of export earnings. Since tobacco has been categorized as a health hazard in most Western markets, its potential as an export crop in developing countries is limited.

The results in Chapters 4 and 6 also suggest that the responsiveness of imports to changes in the real exchange rate is inelastic. As long as there are no locally available substitutes to imported goods, and the share of goods for intermediate consumption in total imports remains high, currency devaluations will only translate into an increase in the import bill and the worsening of the trade balance and balance of payments.

Currency devaluations are expected to contribute to resource allocation and internal balance though the expenditure switching mechanism. Since results of the empirical analysis in Chapter 5 do not support the hypothesis that currency devaluations alter the consumption pattern through an expenditure switching

mechanism, other options, such as price incentives, should be considered as viable instruments for adjusting the product combinations to desired proportions.

Results of the monetary approach to the balance of payments indicate that Malawi has been actively pursing sterilization policy. Although the model yields plausible estimates, particularly with respect to the money demand component, the indication that sterilization exists renders the monetary approach to the balance of payments analysis less applicable to Malawi's economy. This conclusion is expected considering that Malawi's money market is underdeveloped and that the monetary authorities resorted to foreign exchange rationing as a mechanism of dealing with balance of payments crisis in the 1980s.

8.7 Further Research

Although this thesis has attempted to analyze the effects of successive currency devaluations and related macroeconomic policies on Malawi's economy, it does not show the interdependence of various policies on target variables such as trade balance or levels of imports, exports, and investment. This could be pursued by estimating reduced form models and performing simulations using the estimated parameters as beginning values. Alternatively, the interaction of various policy variables on economic performance can be accomplished by using a computable general equilibrium model as the empirical framework. As discussed in Chapter 6, CGE models are now undoubtedly the best empirical tools with which to measure the impact of macroeconomic policies on households. However Sarris (1990) observes that they require much effort and extensive resources to build and that they are data intensive. The author also contends that these models are complex and obscure, making simulated results difficult to trace or explain. In support of Sarris's contention, Pinstrup-Anderson (1990) argues that since many developing countries exhibit production dualism in which semi-subsistence and fully market-oriented farm households coexist, the problem of accounting for non-market activities in the semi-subsistence sector renders CGE models less applicable to the economy-wide analyses of these countries.

Double-log models were used in the estimation of supply of traded and non-traded goods, implying

a constant elasticity of substitution between factors of production. Since the assumed Cobb-Douglas production function specification was not empirically determined or tested, the parameter estimates may not be a true reflection of Malawi's production structure. Future research needs to establish appropriate functional forms for estimating supply parameters.

The aggregate commodity supply functions estimated in Chapter 6 provide a general indicator of how exports respond to relative price and foreign income changes. In order to determine how commodities respond to relative input and output prices, a multi-output functional form, as discussed in Chambers (1988) needs to be investigated.

This study estimated the effect of a partial price deregulation and the removal of subsidies on the supply and demand of traded and non-traded goods only up to 1987. However market liberalization on a wider scale was instituted by an Act of Parliament on 1987. Future studies on the supply and demand of traded and non-traded goods needs to extend the data base to current values and to account for the extended liberalization.

8.8 Bibliography

Edwards, S. "Exchange Rate Misalignment in Developing Countries." *Research Observer*, 6(1989): 3-20.

Haque, N. U., K. Lahiri, and P. J. Montiel. "A Macroeconometric Model for Developing Countries." *IMF Staff Papers* 37(1990):537-557.

Khan, M. S. "Monetary Shocks and the Dynamics of Inflation." *IMF Staff Papers* 21(1980):250-84.

, "Macroeconomic Effects of Fund-Supported Adjustment Programs." *IMF Staff Papers* 37(1990):195-230.

Koestler, U. "Agricultural Trade Between Malawi, Zambia and Zimbabwe: Competitiveness and Potential." *Agricultural Reforms and Regional Market Integration in Malawi, Zambia, and Zimbabwe*. (A. Valdes and K. Muir-Leresche, eds.) IFPRI: Washington, 1993:32-76.

Kydd, J., and A. Hewitt. "The Effectiveness of Structural Adjustment Lending: Initial Evidence from Malawi". *World Development*, 3(1986):347-65.

Mckinnon, R. I. *Money and Capital in Economic Development*. Washington: Brookings Institution, 1973.

Office of the President and Cabinet, Department of Economic Planning and Development. *Statement of Development Policies 1987-1996*. Zomba: Government Printer, 1987.

, Department of Economic Planning and Development, Malawi Government. *SAL IV. Adjustment with Growth and Development: A Proposed Fourth Structural Adjustment Programme*. Lilongwe, 1987.

Pinstrup-Anderson, P. *Macroeconomic Policy Reforms, Poverty, and Nutrition: Analytical Methodologies*. Monograph 3. Ithaca: Cornell Food and Nutrition Policy Program, 1990.

Sarris, A. *A Macro-Micro Framework for Analysis of the Impact of Structural Adjustment on the Poor in Sub-Saharan Africa*. Monograph 5. Ithaca: Cornell Food and Nutrition Policy Program, 1990.

Shaw, E. S. *Financial Deepening in Economic Development*. New York: Oxford University Press, 1973.

Valdes, A. "The Macroeconomic and Overall Policy Environment Necessary to Complement Agricultural

Trade and Price Policy Reforms." *Agricultural Policy Reforms and Regional Market Integration in Malawi, Zambia, and Zimbabwe*. (A. Valdes and K. Muri-Leresche, eds.) IFPRI: Washington, 1993:11-31.

Appendix 1

Table 5.8 Seemingly Unrelated Regression (SUR) Estimates of the Non-linear AIDS Model

	Static Models		Dynamic Model	
Parameter	Estimate	S.E	Estimate	S.E
α_1	0.827*	0.013	0.765*	0.033
$(1 - \lambda_1)$	-	-	0.042	0.026
γ_{11}	0.182*	0.046	0.181*	0.049
γ_{12}	-0.028*	0.016	-0.034*	0.016
γ_{13}	-0.153*	0.034	-0.147*	0.038
β_1	-0.587*	0.025	-0.068*	0.032
α_2	0.071*	0.017	0.044*	0.016
$(1 - \lambda_2)$	-	-	0.100	0.042
γ_{22}	0.005	0.013	0.005	0.010
γ_{23}	0.024	0.015	0.029*	0.012
β_2	0.047*	0.012	0.032*	0.013
α_3	0.101*	0.024	0.191*	0.036
$(1 - \lambda_3)$	-	-	-0.138	0.049
γ_{33}	0.130*	0.037	0.118*	0.038
β_3	0.012	0.018	0.036	0.024
LLF	132.354		134.725	

α_i, β_i, and γ_{ij} = the estimated demand parameters, for i, j = 1,..., 3; 1, 2 and 3 represent non-traded goods, imports and domestically manufactured goods, respectively;
λ_i = estimated partial adjustment coefficients, for i = 1, .., 3;
LLF = the value of the log likelihood function; and
*, and ** imply significance at the 95 per cent and 90 per cent confidence levels, respectively.

Table 5.9 Three Stage Least Squares Estimates of the Non-linear AIDS Model

	Static Models		Dynamic Model	
Parameter	Estimate	S.E	Estimate	S.E
α_1	0.818*	0.013	0.778*	0.024
$(1 - \lambda_1)$	-	-	0.024	0.017
γ_{11}	0.182*	0.053	0.139*	0.034
γ_{12}	-0.035*	0.017	-0.028*	0.010
γ_{13}	-0.128*	0.029	-0.111*	0.027
β_1	-0.080*	0.033	-0.104*	0.035
α_2	0.062*	0.012	0.039*	0.007
$(1 - \lambda_2)$	-	-	0.105*	0.014
γ_{22}	0.000	0.009	0.003	0.004
γ_{23}	0.026*	0.009	0.026*	0.009
β_2	0.056*	0.017	0.043*	0.013
α_3	0.119*	0.019	0.183*	0.023
$(1 - \lambda_3)$	-	-	-0.129	0.023
γ_{33}	0.012*	0.030	0.085*	0.023
β_3	0.024	0.018	0.061*	0.023
SO	18.500		14.410	

SO = a statistic defined in equation (5.41).

Table 5.10 Estimates of Uncompensated Demand Elasticities of the AIDS Model

	Static Models			Dynamic Model
	Non-traded	Imported	Domestically Manufactured	Expenditure
Non-Traded	-0.708 (0.065)	-0.031 (0.019)	-0.031 (0.047)	0.924 (0.033)
Imported	-1.027 (0.316)	-0.986 (0.198)	0.625 (0.260)	1.763 (0.190)
Domestically Manufactured	-0.855 (0.210	0.146 (0.097)	-0.246 (0.217)	1.069 (0.105)

Appendix 2

Malawi Data

Year	Xprice	Mprice	TOT	WPI	WProd	D. Defla	CPI	WCPI	MnPrice	Drate
1964	22.5	0.00	200.00	3.50	48.00	24.80	30.17	4.50	0.00	4.50
1965	23.70	0.00	195.00	3.70	52.00	24.70	31.51	4.80	0.00	4.50
1966	22.90	0.00	190.00	4.30	55.00	25.50	33.11	5.00	40.20	4.50
1967	21.70	53.66	153.00	1.50	57.00	24.10	35.00	4.10	35.00	4.50
1968	24.10	57.43	159.00	2.30	61.00	26.70	35.60	4.40	35.60	5.50
1969	25.30	58.31	164.00	4.20	66.00	27.20	35.90	5.10	35.90	5.50
1970	26.90	57.58	177.00	5.00	67.00	29.30	37.20	6.00	37.20	6.00
1971	29.20	61.25	229.00	4.50	68.00	32.10	40.40	5.90	40.40	6.00
1972	27.80	63.87	165.00	5.40	73.00	32.00	41.90	5.70	41.90	6.00
1973	1980	74.32	159.00	13.70	80.00	28.90	45.90	9.40	45.90	6.00
1974	43.60	100.44	149.00	22.80	80.00	34.10	55.70	15.30	55.70	6.00
1975	52.80	122.08	144.00	8.90	73.00	37.10	61.70	13.50	61.70	6.00
1976	58.70	139.69	140.00	10.00	79.00	40.30	68.50	10.70	68.50	7.00
1977	68.50	155.33	166.00	9.80	83.00	45.90	75.10	11.10	75.10	7.00
1978	61.90	43.05	149.00	7.60	86.00	46.70	78.10	9.40	78.10	7.00
1979	55.80	49.84	118.00	14.70	90.00	48.70	86.00	12.40	86.00	8.00
1980	50.70	57.58	100.00	17.40	91.00	56.90	100.00	15.70	100.00	10.00
1981	74.00	66.01	122.00	13.30	91.00	66.20	110.30	14.40	110.20	10.00
1982	96.50	71.54	123.00	11.30	88.00	72.30	120.10	12.70	121.60	10.00
1983	91.50	79.74	113.00	11.60	90.00	80.60	136.20	12.80	137.10	10.00
1984	100.00	94.54	118.00	10.30	97.00	91.70	151.20	10.60	152.30	10.00

Xprice = Export unit price; Mprice = Import unit price; TOT = Terms of trade;
WPI = World production index; D. Defla = Domestic GDP deflator; CPI = Domestic consumer price index; WCPI = Percentage change in the world consumer price index; MnPrice = Wholesale price index in the manufacturing/industrial sector; Drate = Discount rate;

Year	Popln	GDP	GNP	G.Cons	Exports	Imports	M.Bal	D.Cred	Rsev	K-Flo
					Million Kwacha					
1964	3.80	153.40	147.20	23.80	28.83	32.15	0.00	0.00	0.00	1.20
1965	3.91	180.20	175.90	26.80	28.82	46.17	25.27	7.05	18.03	4.60
1966	4.02	204.40	198.80	31.60	34.81	61.19	29.42	16.51	15.31	11.30
1967	4.12	215.50	207.70	34.50	41.04	57.39	33.18	21.02	18.76	15.80
1968	4.23	225.40	218.40	36.70	40.53	66.66	35.78	20.56	18.76	21.00
1969	4.33	244.40	238.70	37.90	43.97	69.29	40.42	25.07	17.50	25.20
1970	4.44	267.10	261.00	41.00	49.70	82.49	47.15	24.43	24.34	29.47
1971	4.55	334.90	331.70	46.60	59.32	89.75	56.73	30.73	24.50	29.64
1972	4.67	359.10	355.40	46.80	64.49	102.91	62.94	37.75	27.81	26.64
1973	4.79	364.00	364.80	48.70	79.95	114.66	84.82	31.92	54.89	30.49
1974	5.10	461.50	473.90	65.70	101.31	157.74	115.89	52.83	68.73	39.79
1975	5.24	529.70	540.40	74.70	122.12	218.66	122.36	104.66	55.29	58.39
1976	5.37	612.00	594.50	86.30	151.64	188.45	121.04	141.50	23.79	49.18
1977	5.54	728.00	706.00	98.60	180.34	211.80	161.00	131.89	76.18	42.55
1978	5.68	800.70	796.70	134.20	155.66	284.75	168.55	184.15	60.87	53.59
1979	5.86	864.50	829.70	164.20	189.83	325.76	170.09	267.15	51.57	85.72
1980	6.05	1005.10	924.00	193.90	239.25	356.21	191.52	310.71	59.08	85.81
1981	6.23	1108.10	1033.80	198.00	255.77	321.14	241.41	398.06	48.43	85.20
1982	6.41	1245.10	1143.80	218.30	256.59	322.12	276.38	471.32	24.86	61.30
1983	6.62	1436.90	1297.90	235.90	270.61	363.77	292.78	540.02	17.38	57.50
1984	6.84	1707.40	1628.60	268.00	446.24	381.57	388.29	545.07	88.97	86.50
1985	7.06	1944.90	1854.00	344.00	428.14	490.44	384.43	618.49	73.41	73.20
1986	7.28	2197.60	2084.70	433.80	466.48	481.34	488.81	753.37	37.52	130.40
1987	7.50	2614.00	2488.00	487.70	614.76	652.91	668.47	745.52	100.17	218.70
1988	7.75	3417.90	3280.00	565.90	753.36	1045.43	812.49	578.62	366.28	375.73
1989	8.03	4388.20	4251.10	647.40	745.36	1393.77	861.69	715.44	276.29	363.95

Popln = Population; GDP = Gross domestic product; GNP = Gross National product; G.Cons = Government consumption; M.Bal = Nominal money balances (M2); D.cred = Domestic credit; Rsev = Foreign reserves; K-Flo = Net capital flows;

	Exchange Rates						Percent
Year	Germany	U.K	Zimbabwe	S. Africa	Zambia	U.S.A	Devaluation
1964	0.19	1.99	1.00	1.00	1.00	0.71	0.00
1965	0.18	2.00	1.00	1.00	1.00	0.71	0.00
1966	0.18	2.00	1.00	1.00	1.00	0.71	0.00
1967	0.18	2.00	1.02	1.02	1.02	0.73	14.00
1968	0.21	1.99	1.17	1.16	1.17	0.83	0.00
1969	0.21	1.99	1.17	1.16	1.17	0.83	0.00
1970	0.23	2.00	1.16	1.16	1.17	0.83	0.00
1971	0.24	2.03	1.24	1.17	1.16	0.83	0.00
1972	0.25	2.01	1.23	1.04	1.12	0.80	0.00
1973	0.31	2.01	1.35	1.18	1.26	0.82	0.00
1974	0.33	1.97	1.53	1.24	1.31	0.84	0.00
1975	0.35	1.92	1.38	1.18	1.34	0.86	0.00
1976	0.36	1.65	1.46	1.05	1.28	0.91	0.00
1977	0.39	1.58	1.43	1.04	1.14	0.90	0.00
1978	0.42	1.62	1.25	0.97	1.05	0.84	0.00
1979	0.45	1.73	1.20	0.97	1.03	0.82	0.00
1980	0.45	1.89	1.26	1.04	1.03	0.81	0.00
1981	0.40	1.82	1.30	1.03	1.03	0.90	0.00
1982	0.43	1.85	1.39	0.98	1.14	1.06	15.00
1983	0.46	1.78	1.16	1.06	0.94	1.17	12.00
1984	0.50	1.89	1.14	0.98	0.79	1.41	3.00
1985	0.58	2.23	1.07	0.78	0.63	1.72	15.00
1986	0.86	2.73	1.12	0.82	0.25	1.86	19.50
1987	1.23	3.62	1.33	1.09	0.25	2.21	20.00
1988	1.46	4.56	1.42	1.13	0.31	2.56	15.00
1989	1.47	4.52	1.31	1.05	0.21	2.76	
1990	1.69	4.87	1.11	1.05	0.09	2.73	